FRONT AVENUE LP PROPERTIES
CSM Site Summary

FRONT AVENUE LP PROPERTIES

Oregon DEQ ECSI #: 1239

Address 4950, 5034, and 5200 NW Front Avenue

DEQ Site Mgr: Alicia Voss
Latitude: 45.5594°
Longitude: -122.7333°
Township/Range/Section: 1N/1E/19

River Mile: 8 West bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the three parcels at the Front Avenue LP site to the river is summarized in this section and Table 1, and supported in following sections.

1.1 Overland Transport

Steel mill slag was used as fill material over a large portion of the site including the river bank. The slag fill near the surface may be subject to erosion and overland flow. Although some overland runoff may occur on Parcels 1 and 3, runoff from the majority of the site likely drains primarily to the stormwater systems on each parcel (MFA 2002).

1.2 Riverbank Erosion

Riverbank erosion is expected to be limited due to armoring of the bank by slag from the former Oregon Steel Mill. However, the slag itself may serve as a source of metals contamination to the river sediment.

1.3 Groundwater

No groundwater plume has been delineated at the Front Avenue LP site; however, isolated detections of VOCs, SVOCs, and TPH have been recorded in two temporary wellpoints. In addition, free product was noted by IT Corporation during a soil and groundwater investigation along the shared property boundary of Front Avenue LP Parcel 2 and McCall Oil & Chemical Corporation (ESCI # 134) in 2001. A substantial portion of the site is filled riverbed. Shallow groundwater flow at the site is generally toward the Willamette River and is a potential transport pathway. Available files indicate that stormwater lines and dry wells (for disposal of stormwater) are present beneath the site. However, no information has been presented regarding the depths of the utilities and dry wells at the site relative to the shallow groundwater table or if the utilities and dry wells may be a preferential pathway at the site.

1.4 Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

Overwater activities appear to be limited to ships delivering raw materials to facilities at the site (e.g., sand and aggregate to Glacier NW on Parcel 1). There are no records of overwater releases. Each parcel has its own stormwater management system. Parcel 1 drains to a system of permitted dry wells, but a former settling pond once existed on this parcel that is thought to have possibly been part of the stormwater drainage system for Parcel 2 (i.e., the former pond may have drained to the river). The stormwater pathway for sources on Parcel 2 may be complete, as evidenced by an observed release of graphite from the Tube Forgings of America (TFA) facility emanating from outfall WR-7 on the Willamette River (DEQ 1999). A complete pathway for sources on Parcel 3 has not been confirmed, though MFA (2002) notes that site pavement is designed to direct all runoff to the storm drains.

1.5 Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6 Sediment Transport

Front Avenue LP Properties is located along the main river stem directly across from the Cascade General Shipyard on Swan Island. This river channel in the portion of the river is depositional based on the sediment-profile and time-series bathymetry surveys (Integral et al. 2004). The Sediment Trend Analysis® results also suggest that the river here is totally depositional. The time-series bathymetric change data over the 25-month period from January 2002 through February 2004 (Integral and DEA 2004) indicates the situation may be more complex. On the upstream border of the property in the small embayment, there is relatively large, circular area of net sediment erosion (of up to 2 feet) that extends towards the river channel. Along the main river, sediment accretion is evident at the upstream end of the property, but net erosion is evident close inshore along the downstream portion. No sediment transport information is available for the bank areas at this site.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: August 31, 2005

3. PROJECT STATUS

Several site investigations have occurred on this site since 1989. A LUST file remains open, as a release from former Bunker C USTs has not been defined.

Activity		Date(s)/Comments
PA/XPA	☒	PA prepared June 20, 2002 (MFA 2002)
RI	☐	
FS	☐	
Interim Action/Source Control	☒	Soil excavations performed on Parcels 1 and 2 in 1990s.
ROD	☐	
RD/RA	☐	
NFA	☐	

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Tier 3

4. SITE OWNER HISTORY

Sources: Multnomah County Assessment & Taxation, Oregon DSL, USACE hydrographic maps, Metsker's Atlas of Multnomah County, Polk City of Portland directories, DEQ 2004a,b, MFA 2002

Site Area	Owner/Occupant	Type of Operation	Years
Historical Site (uplands, pre-filling)	Multnomah County sheriff and City of Portland (owners)	Undeveloped	1930-1942
Historical site (riverbed and filled riverbed)	Oregon Department of State Lands	Riverbed	1859 - 1967?
	Morris Schnitzer (owner)	Undeveloped	Mar. 1942-Oct. 1942
	Oregon Electric Steel Rolling Mills (Oregon Steel Mills after 1946; owner)	Steel Mill	Oct. 1942-Jan. 1956
	Gilmore Steel & Supply Company (Gilmore Steel Corporation after 1966; owner)	Steel Mill	Jan. 1956-Sept 1978
Portion below low water line	Port of Portland (owner)	To be filled	1966 - 1973, 1977 and 1978
Portion of Port of Portland property	Walter E. Jameson (as trustee for Gilmore Steel Corporation Washington Trust)		April 1973-
Portion of property	City of Portland	Sewer easement	1977- present
Entire Site	Portland General Electric and Willamette Development Corporation (owners); assigned property to Emery Zidell, Charlene Sherwood, and Vicki Zidell		Sept 1978-
	Emery Zidell (owner)		1983/1984-1994, 1996
5034 NW Front Avenue **(Parcel 1)** DSL owned riverbed until 1967	Front Avenue LP (owner)		1994?-present
	R.A. Hatch Company/Hatch Construction (operator)	Staging area, rock crushing	1983-1989?
	Glacier Northwest, Inc. (operator)	Cement manufacture	Unknown -2000
	Lone Star NW (operator)	Concrete batch plant	1988 - Unknown
5200 NW Front Avenue **(Parcel 2)** Most of site prior to filling was lake bed and river shoreline (unknown ownership)	Front Avenue III LP (owner)		1996-present
	Tube Forgings of America (owner/operator)	Pipe fittings manufacture	Unknown – present (owner) 1979-present (operator)
	TFA Inc. (operator)		1986/87 - Unknown
4950 NW Front Avenue **(Parcel 3)** Approx. one-half of parcel was DSL-owned riverbed until 1967	Front Avenue II LP (owner)		1994-present
	Tricon Forest Products (operator)	Lumber reloading facility	1988-1993
	CMI/Hampton Lumber (owner/operator)	Lumber products storage	Unknown – present (owner) 1985 – present (operator)
	Hampton Lumber (operator)	Raw material storage	1985 - 1998
Zidell Property **(Parcel 4)**	Emery Zidell and Trustees, Front Avenue LP, Front Avenue III LP, Front Avenue II LP (owners)		Unknown - present
DSL owned riverbed until 1967?	Glacier Northwest (operator)	Concrete plant	Unknown - present
	CMI/Hampton Lumber (owner/operator)	Lumber products storage	1985 - present

Site Area	Owner/Occupant	Type of Operation	Years
	Tube Forgings of America (owner/operator)	Pipe fittings manufacture	1979 - present
	Lone Star NW (owner/operator)	Concrete batch plant	Unknown
	Hampton Lumber (operator)	Raw material storage	1985 - 1998
	Tube Forgings of America (operator)	Pipe fittings manufacture	1986/87 – Unknown
	The Fitness Agency (operator)	Unknown	1986/87 – Unknown
	Steel Construction Co. of Oregon (operator)	Building Contractors	1950 – 1960 (?)
	Oregon Steel Mills (operator)		1950 – 1965 (?)

5. PROPERTY DESCRIPTION

The Front Avenue LP Properties site is located on the west bank of the Willamette River at RM 8, across from Swan Island. The area is primarily industrial; no residentially zoned properties occur within 0.25 mile of the site (DEQ 1999). The site consists of four tax lots occupied by three separate business owners: Glacier Northwest, Inc. (Glacier NW) at 5034 NW Front Avenue (Parcel 1); Tube Forgings of America (TFA) at 5200 NW Front Avenue (Parcel 2); and Construction Materials, Inc. Northwest (CMI NW) at 4950 NW Front Avenue (Parcel 3; DEQ 1999; MFA 2002). The fourth parcel consists of a 3.32-acre strip of undeveloped land along the shoreline, which is owned by Zidell trustees. The property is bordered to the north by McCall Oil & Chemical Corporation (MOCC; ECSI #134), to the south by Shaver Transportation (ECSI #2377), to the west by NW Front Avenue, and to the east by the Willamette River (MFA 2002).

The site is relatively flat and is located between approximately 30 to 38 feet above sea level, above the 100-year flood level. A bermed area exists between the TFA and Glacier NW parcels. The river bank is primarily armored with slag from former Oregon Steel Mill operations at the site (MFA 2002). Two docks are present, one that is actively used by Glacier NW to offload sand and aggregate, and one unused dock near the CMI NW parcel (Parcel 3). Railroad spurs exist on Parcels 2 and 3 (MFA 2003).

Two City of Portland stormwater outfalls (OF-19 and OF-19A) are located along the property's east-southeastern boundary. Both outfalls were constructed in 1977. Outfall 19 is a 42-inch pipe that receives runoff from 475 acres of industrial and vacant properties, Portland's Forest Park, and Oregon Department of Transportation (ODOT) storm lines. OF-19A is a 36-inch pipe located approximately 100 feet north of OF-19, which receives runoff from approximately 4.8 acres, primarily along the NW Front Avenue right-of-way (MFA 2002).

Currently, there are three private outfalls at the site: WR-7, WR-256, and WR-257. WR-7, an 18-inch outfall, drains the eastern part of the TFA facility (Parcel 2) and discharges to the Willamette River on Parcel 1 near the northern property boundary with MOCC. Discharges from WR-7 are monitored under the requirements of TFA's NPDES general 1200-Z permit (file #104856). WR-256 and WR-257 are located on the CMI NW parcel (Parcel 3) north of the unused dock; stormwater from this property may discharge from these outfalls (MFA 2002).

Details of the current facilities on the three developed parcels are provided in the following sections.

Glacier NW (Parcel 1; see Supplemental Figure 5 from MFA 2002)

Parcel 1 includes 11.71 acres bound by MOCC to the northwest, by undeveloped riverfront land to the northeast, by CMI Northwest on the southeast, and by TFA on the southwest. The Glacier NW facility includes an office trailer, wet and dry batch mixing areas (including a conveyor system and hoppers), a boiler (natural gas-powered) building, batch room, wastewater collection basin and treatment tanks, a maintenance shop, steam-cleaning pad with an oil/water separator, vehicle wash areas, and a dock. The site is fenced to restrict access. Piles of aggregate and sand used to manufacture concrete are present onsite. The process areas are paved with concrete or asphalt and are bermed or sloped to direct all process waters to a concrete collection basin. The aggregate reclaim area is unpaved (MFA 2002).

A 20,000-gallon diesel aboveground storage tank (AST) with secondary containment is located in a covered area on the north side of the maintenance shop. Several 275-gallon ASTs that store motor oil, hydraulic oil, and used oil are located in a covered area next to the south end of the maintenance shop, and have secondary containment. No records of USTs or leaking USTs (LUSTs) have been identified as being currently or historically present on Parcel 1 (MFA 2002).

Currently, stormwater on Parcel 1 is managed using seven dry wells (wells 10521-1 through 10521-7) permitted by a water pollution control facilities (WPCF) 1000 permit, and registered with DEQ's underground injection control (UIC) program. Though WP-7, WP-8, and WP-10 discharge to the Willamette at the northeast end of Parcel 1, these outfalls drain other parcels (including MOCC); no stormwater from Parcel 1 reportedly discharges to the Willamette (MFA 2002).

TFA (Parcel 2; see Supplemental Figure 6 from MFA 2002)

Parcel 2 includes 13.76 acres bound by MOCC to the northwest, by Glacier NW to the northeast, by CMI Northwest to the southeast, and by NW Front Avenue on the southwest. The Willamette River is located approximately 550 feet northeast of the facility (MFA 2002).

TFA has operated a carbon steel pipefitting factory on the site since 1979. The facility includes a sheet metal fabrication building, a sheet metal storage building, an office building/trailer, and a parking area immediately adjacent to NW Front Avenue (see Supplemental Figure 6). An overhead crane and railroad spur exist south of the fabrication building (MFA 2002).

The areas around the site structures are paved with asphalt with the exception of unpaved storage areas south of the fabrication building where pipe is stored, and along the northeast property boundary where pipe, finished product, and scrap metal are stored (MFA 2002).

Currently, stormwater at the facility flows to 19 catch basins within three drainage areas (see Supplemental Figure 6). Area 1 drains the north and east sides of the site and discharges to the Willamette River through WP-7, which is regulated by an NPDES general 1200-Z permit (file 104856), issued September 1991. Area 2 drains the southwest portion of the site and discharges to the City's storm sewer system (at C2, Supplemental Figure 6). Area 3 drains the northwestern portion of the site and discharges to the City stormwater system (at C3, Supplemental Figure 6). Areas 2 and 3 are within the City's OF-19 drainage system (Figure 1). The facility maintains a current DEQ-approved stormwater pollution control plan (MFA 2002).

CMI NW (Parcel 3; see Supplemental Figure 7 from MFA 2002)

This 15.33-acre parcel is bounded by TFA and Glacier NW to the northwest, by the Willamette River to the northeast, by Shaver Transportation to the south, and by NW Front Avenue to the west. The CMI NW facility includes a storage building and an office trailer. The entire site is fenced to restrict access and paved with asphalt that slopes to the site catch basins. A dock is present at the parcel riverfront, but is unused. A 6,000-gallon diesel AST is located near the northwestern corner of the parcel; the AST is not covered. A propane AST used for fueling forklifts is located near the diesel AST (MFA 2002).

Stormwater at the facility is gathered by catch basins that discharge to the Willamette River through two private outfalls (WR-256 and WR-257). No record of a permit was found for these outfalls. Sheetflow runoff was not observed during rainfall occurring during the MFA site visit. City of Portland outfalls OF-19 and OF-19A discharge to the Willamette immediately south of the property. These outfalls drain a 480-acre area of predominantly vacant industrial properties west of Parcel 3, portions of Forest Park, and ODOT right-of-ways (MFA 2002).

Information about the lease of submerged lands or overwater facilities at any of these parcels was not found in Oregon Department of State Lands (DSL) files.

Zidell Trustees (Parcel 4; see Figure 1)

The 3.32-acre shoreline parcel is an undeveloped strip of land owned by Zidell Trustees. DEQ (1999) noted that "there was no apparent contamination sources" along this strip of land and so was not included in the preliminary assessment. For this reason, the remainder of this report focuses on Parcels 1 through 4.

6. CURRENT SITE USE

Unless otherwise noted, the details regarding site processes on the three developed parcels, described below, were provided primarily by MFA (2002).

Glacier NW (Parcel 1)

Formerly known as Lone Star Northwest, Inc., this company has operated a batch plant for the production of concrete for offsite delivery since 1989 (MFA 2002). Glacier NW was added to the ECSI database (# 2378) on June 18, 1999 based on initial sampling results from sediment sampling in the Willamette River (DEQ 2004a).

Both dry and wet batch processes, using aggregate, sand, Portland cement, fly ash, concrete admixtures, water, and liquid color, are employed at the facility. Hydrochloric acid is used to adjust process water pH for recycling. Truck wash chemicals and small amounts of phosphoric acid are also used onsite. A subcontractor (Ultra Block) uses returned concrete to manufacture "Ecology" blocks on a portion of the facility (MFA 2002).

Dry aggregate and sand used at the site are delivered by barge from Glacier NW's quarry in Scappoose, Oregon. The materials are offloaded at the dock and piled onsite by radial stackers. The Portland cement and fly ash are delivered by truck. The concrete admixtures are stored in bermed, covered areas in a building adjacent to the boiler building (see Supplemental Figure 6). Color for the concrete ('Davis color') is stored in 330-gallon storage totes in a separate building; no residuals are generated (MFA 2002).

As mentioned above, the process areas are paved with concrete or asphalt and are bermed or sloped to direct all process waters to a concrete collection basin. The facility obtains process water from the Willamette River (under Oregon Water Resources Department permit No. 51444), the City's municipal supply, and from the facility's process water recycling system. Wastewater from concrete mixing and truck wash water is drained to a 40,000-gallon concrete collection pond. From the pond, the water is transferred to a 20,000-gallon slurry tank, treated with hydrochloric acid to adjust the pH, and discharged to a 20,000-gallon holding tank for potential reuse (building washes, dust control, mixer truck water, etc.). Excess treated water is discharged to the sanitary sewer at a metered maximum rate of 6,000 gallons per day annually.

Truck maintenance is performed in the maintenance shop. Wastes generated in the maintenance shop include used antifreeze and oil, oil filters, and aerosol cans. Used oil and antifreeze are recycled offsite; aerosol cans are punctured and "properly disposed of." MFA (2002) notes that oil filters are drained but there is no specific mention of their disposal. There are two parts washers that reuse solvent, and no waste solvent is reportedly generated. It is not noted whether an outside company services these parts washers. No floor drains exist in the maintenance shop (MFA 2002). DEQ records list Glacier NW as a conditionally exempt generator (CEG) of hazardous waste, noting no hazardous waste streams recorded for the site from 1993-2003 (DEQ 2004a). In 1991 and 1992, the site was listed as a small quantity generator (SQG), and reported 1.173 tons of waste petroleum naptha generated from flush rinsing of auto parts in 1992 (DEQ 2004a).

Wastewater from a steam-cleaning pad located southwest of the maintenance shop is routed by the surrounding apron to an oil/water separator (OWS) with a filtration system. From the OWS the water is discharged to the sanitary sewer.

Two baghouses operate under a general air containment discharge permit (#263265; DEQ 2004a) for ready-mix concrete (AQGP-009, SIC 3273). Emissions from the concrete production and the natural-gas boiler are reportedly in compliance (MFA 2002; DEQ 2004a).

TFA (Parcel 2)

The TFA facility manufactures carbon-steel pipe fittings. Equipment used at the facility includes forges, presses and dies, saws, torches, shot tumblers, bevellers, Rotoblast machines, grinders, a paint dip tank, and infrared dryer.

Products used at the TFA facility include low-carbon steel, water-based coolant (Laser II), steel shotblast, used motor oil (purchased offsite and used as a lubricant in the manufacturing process), antifreeze, motor oil (in forklifts), hydraulic oil, water-based enamel paint, propane, and solvents (petroleum naphtha used in a Safety Kleen, Inc. parts washer in the maintenance area). Cut pipe sections are lubricated in a spray booth, using a molasses and graphite lubricant solution on pipe and dies in the elbow-forming process, and used motor oil and graphite on pipe in the tee-forming process.

Water for facility processes is supplied by the COP. Washwater is generated during the cleaning of coolant and metal shavings from the pipe-cutting bandsaw. The coolant and shavings are recycled, and the washwater is discharged to the sanitary sewer. Steamcleaning of accumulated scale from press dies is performed in a covered area in the northeast portion of the manufacturing building (see Supplemental Figure 6). The washwater generated is collected in a sump and drained to an aboveground OWS with a filtration system. The oil is disposed offsite by a contractor, and the washwater is collected in tanks and discharged to the sanitary sewer per a COP BES discharge authorization for batch discharges.

Wastes generated at TFA include scrap steel, used solvent, antifreeze, and oil, baghouse dust, and paint solids from the dip tank. The blowout shack (see Supplemental Figure 6) generates residual steel shavings from cut pipe, which are recycled along with other scrap metal by a recycling contractor (Bob's Metals). Waste solvent is disposed of by Safety-Kleen, Inc. Dust generated by three steel shotblast machines (used to descale parts) is collected in a baghouse (see Supplemental Figure 6) and disposed of as solid waste. Used oil is recycled by a contractor (Emerald). Paint solids accumulated in the dip tank are cleaned out every 12 to 18 months and disposed of as nonregulated material [AK4550 solid debris (press)] at Chemical Waste Management Northwest in Arlington, Oregon.

CMI NW (Parcel 3)

CMI NW, formerly known as Hampton Lumber Sales Company, has leased Parcel 3 since August 1, 1994. No manufacturing or other notable processing takes place at the CMI NW facility. The site is used for storage and reloading of lumber and other building products onto railroad cars for shipment. The lumber and products are delivered to the site by truck.

MFA (2002) indicates a 6,000-gallon AST containing diesel fuel and a propane tank are located west of the maintenance building. Oil and antifreeze are stored in 55-gallon drums in the storage building. The oil is used for vehicle maintenance (as is the antifreeze) and also for bar oil on chainsaws. The products are dispensed from the drums within the maintenance building. No secondary containment was observed; drips were directed through a rain gutter to a used oil drum. Used oil is properly disposed of offsite. Forklift maintenance is performed monthly by a contractor, and all waste generated by vehicle maintenance is disposed of offsite by that contractor. Though no further details are provided, MFA (2002) notes that all other waste generated at the property is either recycled or properly handled and disposed of offsite.

7. SITE USE HISTORY

Large portions of the site were formed by filling the riverbed and lake bed from 1887 through 1980. A large volume of fill was placed on Parcels 1 and 3 between the 1940s and the 1970s. The fill was made up of slag from Oregon Steel Mills (which began operating a mill at the site in approximately 1942), dredged material from the Willamette River, and construction debris (MFA 2002). Fill is estimated to range from 15 to 45 feet thick on all but the northeastern third of the property (SE/E 1989b).

Parcel 1

Parcel 1 was largely riverbed through the 1960s. Once filled, Parcel 1 was vacant and undeveloped until it was leased to R.A. Hatch Company (Hatch Construction) of Bend, Oregon in 1983. Hatch Construction used the parcel as a staging area, rock crusher site, and stockpile area for aggregate used in road construction. Hatch Construction was allowed to excavate sand fill from the site but was to regrade the parcel for future development. A “settling pond” measuring approximately 150 feet wide by 650 feet long by 15 feet deep was noted in the northwest portion of Parcel 1 from 1964 to approximately 1983 (MFA 2002; FSI 1983; Oregon Steel Mills 1968). The pond was also labeled a “sump” in a 1974 property map, and included an outfall easement to the river and a “slag dike” located immediately to the east (MFA 2002). The pond may also have been part of the stormwater drainage system from Parcel 2 (DEQ 1999) and/or a low-lying area subsequently filled with construction debris by Hatch Construction (MFA 2002). Lone Star began its lease of the parcel in 1989, and changed its name to Glacier Northwest in January 2000 (MFA 2002). DEQ (1999) noted an apparent lack of documented use or occurrence of chemical contaminants on the parcel.

Prior to development by Lone Star, a Phase I Environmental Site Assessment (ESA) was performed on Parcel 1 and an eastern section of Parcel 2 in 1989. The ESA recommendations included:

- Cleaning, removal, and disposal of former USTs temporarily stored on Parcel 1
- Removal of all drums observed on Parcel 2
- Characterization and removal of soil with visible petroleum contamination
- Collection of surface soil samples from areas of concern (the sandblast shed on Parcel 2, slag near the sandblast shed, powdery residue next to a shed marked ‘no smoking,’ oily residue near a suspected sump, oily residue and slag next to a concrete drum storage slab, and isolated oily areas.
- Analysis of soil samples for priority pollutant metals and TPH, analysis of selected visibly impacted samples for PCBs, analysis of a composite slag sample for EP toxicity metals, assessment of fill materials from seven borings for metals and TPH concentrations
- Analysis of groundwater samples from the borings for metals, VOCs, TPH, and alkalinity, and analysis of one groundwater sample for VOCs, SVOCs, PCBs, metals, cyanide, and phenols (MFA 2002).

These activities were completed during a Phase II ESA conducted in 1989 (MFA 2002). Sampling results from the Phase II are summarized in Section 10 below.

Parcel 2

Historical maps show Guilds Lake present either beneath or to the west of Parcels 2 and 3; the lake was filled sometime between 1897 and 1940. Oregon Electric Steel Rolling Mills (Oregon Steel Mills) developed a mill on the site in approximately 1942. Some filling with slag from the mill occurred along the shoreline between 1941 and 1948. In 1950s the facility included a rolling mill, a steel warehouse, a machine shop, a pattern shop, melt building, cranes, a pump house, and an office. Bunker C USTs were excavated from the former pump house in 1988 (MFA 2002). A pipeline from a dock on the river to a tank at the northeast corner of the rolling mill existed from approximately 1950 to 1970; the dock included a pump house that was a "water diversion point" (MFA 2002).

Site operations from 1969 to the 1970s included melting scrap iron and/or iron pellets, which produced slag waste with a high pH. Air emissions from the steel mill may have included lead and cadmium particulates (MFA 2002).

TFA began operations on Parcel 2 by 1980, but excavated extensively inside the existing buildings before occupying the site; the disposition of the excavated material is not known. Past site operations were similar to the current operations described above, but also included a water-based paint spray booth, and the use of sodium hydroxide to remove paint from pipe hooks, which produced sodium hydroxide residue waste (disposed of in onsite dumpsters). Hydraulic oil used in presses was stored in steel reservoirs in the building (MFA 2002).

A release was reported to DEQ in November 1988 during the removal of two 20,000-gallon USTs that formerly contained Bunker C oil. The site was assigned LUST site number 26-88-0116. The tanks had been installed and operated by Oregon Steel Mills prior to 1976, and were located in or near the former pump house observed in a historical Sanborn fire insurance map. TFA reportedly never used the tanks. Petroleum-impacted soil was observed from 2 to at least 16 feet bgs during the excavation and removal of the tanks. The bottoms of the tanks were located between 13 feet and 14 feet bgs. The supply pipeline to the USTs was located along the property line, running east from NW Front Avenue. One thousand cubic yards of soil was excavated and disposed of at a landfill in Vancouver, Washington (MFA 2002). Samples collected in the vicinity of the former USTs are discussed in Section 10.1.1 below.

Though diagrams of the former Oregon Steel Mill facility indicate an electrical substation present on the property that may have contained PCB transformers, PCB oils have reportedly not been used at the TFA facility (MFA 2002).

TFA registered as a RCRA Hazardous Waste Generator in 1989 when 800 gallons of solids and 1,550 gallons of waste flammable liquids were transported offsite (DEQ 1999). The facility indicated that event was a one-time disposal of spent solvents, and that the facility was not a regular generator of hazardous wastes (DEQ 1999). The origin of the waste may have been from parts-washing operations "in an underground Smith oil/water interceptor system that discharged to the COP sanitary sewer system," sludge from parts washing, and waste hydraulic oil (MFA 2002). The waste solvent and used oil were held in a steel AST and picked up by Inman Oil Company. The water-based paint and steel shot used at the facility were stored in drums on a concrete slab near the craneway. These drums and impacted soil were removed in 1992 in accordance with a DEQ Stipulation and Final Order (SFO) discussed below (MFA 2002).

Based on a complaint, DEQ conducted inspections of the site on November 20 and December 10, 1991 (DEQ 2004b). Site conditions included:

- Approximately forty-three 55-gallon containers of waste stored onsite. The majority of the containers were in poor condition, and several were located on soil in a non-upright position. The contents in the majority of the containers were unidentifiable at that time (DEQ 2004b)
- Three aboveground waste storage tanks without secondary containment (MFA 2002; DEQ 2004b)
- Stored batteries, some of which were broken (DEQ 2004b)
- Approximately 300 cubic yards of scrap metal and shavings
- Oily material spilled on the ground near the steam-cleaning area

- Blockage of a discharge line by an unknown solid.

A *Notice of Noncompliance* was issued by DEQ to TFA on December 31, 1991 (MFA 2002). In April 1992, DEQ issued TFA an SFO to properly manage existing hazardous waste and to conduct an investigation of site soil and the Smith OWS and associated drain lines near a steam-cleaning area. TFA signed the SFO on May 1, 1992 (MFA 2002).

Investigation into the wastes in the drums and USTs onsite revealed (MFA 2002):

- Sodium hydroxide stored in a tank west of the fabrication building
- A waste oil AST containing toluene, xylenes, and methylene chloride
- Drums containing liquids and solids that contained concentrations of 1,4-dichlorobenzene, chromium, and lead
- Nonhazardous wastes including 'nicad' and lead batteries, and scrap metal.

All the wastes were properly disposed of in 1992. TFA implemented a written spill contingency training and a proper drum handling and tracking system, and minimized hazardous waste streams. Sampling for the required site investigation was performed in September 1992; soil analytical results are summarized in Section 10.1.1 below. At the time, a facility 'drainline' was connected to a Smith OWS that consisted of a flow-through tank and a containment tank that separated oil from the water before discharging to the City sanitary sewer system. The Smith OWS and associated drain lines were removed in October 1992; soil, sludge, and fluid samples were collected (see Section 11.3). Following the assessments and removal of impacted soil and the Smith OWS system, DEQ determined in January 1994 that the requirements of the SFO had been satisfied (MFA 2002).

TFA was added to DEQ's ECSI database in August 1992 as site #1239. Because the parcel is contiguous to Parcels 1 and 3, they were included in ECSI #1239 (DEQ 1999).

Parcel 3

The eastern portion of this parcel was created by filling the riverbed (and lake bed) in the 1940s. The fill consisted primarily of dredged material from the Willamette, with slag material armoring the riverbank. The ground surface in the western portion of the parcel also appears to be armored with slag (MFA 2002).

Historical aerial photos from 1957 through 1977 show piles that suggest Parcel 3 had been used to store various raw materials during this period (DEQ 1999). The parcel was undeveloped until 1988 when it was leased by Tricon Forest Products, Inc. (Tricon) and used as a lumber reloading facility (MFA 2002). Tricon occupied the site until 1993. CMI Northwest began its lease of the parcel on August 1, 1994 for use as a storage and reloading facility for lumber and other building products (MFA 2002).

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion.

8.1 Uplands

The sources listed in Table 1 and discussed below are areas of environmental concern identified in DEQ's Strategy Recommendation (DEQ 1999) and the Preliminary Assessment prepared for the site (MFA 2002).

Site-wide, and including on the Zidell shoreline lot, slag used as fill material is a potential source of metals to subsurface soil, groundwater, and river sediment. No TCLP data are available. Potential contaminant sources on the developed parcels are listed below.

Parcel 1

Potential source areas identified on Parcel 1 include:

- Maintenance shop operations: waste streams include used motor oil and antifreeze, and used oil filters (MFA 2002).
- 20,000-gallon diesel AST located adjacent to the maintenance shop (includes secondary containment)
- Several 275-gallon ASTs storing motor oil, hydraulic oil, and used oil located adjacent to the south end of the maintenance shop (include secondary containment)
- The steam cleaning area near the maintenance shop
- Former settling pond: thought to be part of historical stormwater drainage from Parcel 2/Oregon Steel Mill

Parcel 2

Potential source areas identified on Parcel 2 include:

- Former Bunker C USTs and piping
- TFA manufacturing and site operations:
  - AST storage area identified in site diagram (Supplemental Figure 6)
  - Current drum storage area
  - Former battery storage area
  - Former caustic (methylene chloride) tank
  - Former drum storage area
  - Former process tank storage area
  - Former sand blast shed/shot blast material
  - Former steam cleaning area
  - Former waste oil tank
  - Low carbon steel shavings pile
  - Mandrel rack /electrical motor storage area
  - Mandrel rack and craneway
  - Former Smith OWS
- Current and/or historical substation transformers (Oregon Steel Mill) – noted on 1968 site diagram (Oregon Steel Mill 1968).
- Historic steel mill air emissions
- Railroad spur – present on parcel.

Parcel 3

Potential source areas identified on Parcel 3 include:

- Vehicle maintenance operations: drums of oil and antifreeze are stored in storage building without secondary containment
- Diesel AST
- Railroad spur.

8.2 Overwater Activities

☒ Yes ☐ No

The only overwater activities are associated with the current and historical delivery of raw materials to parcels at the site (i.e., sand and aggregate to Glacier NW, etc.).

Information about the lease of submerged lands or overwater facilities at any of these parcels was not found in Oregon DSL files.

8.3 Spills

The records of DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], facility-specific technical reports, and DEQ correspondence were searched for information on known or documented spills at the site.

No significant spills are known to have occurred at the site. Only three spills are noted in the above databases. The spill occurred on January 8, 1999 at Lone Star Sand and Gravel (currently Glacier NW); a worker dropped a bucket containing 1.5 gallons of oil into the Willamette River and then tried to catch it with the same bucket (Integral et al. 2004). Due to the low volume of the spill, DEQ required no spill report or follow-up action (DEQ 1999). A second spill at the Lone Star Sand and Gravel facility occurred in June 1998 when approximately 200 to 300 pounds of lime was released into the Willamette River; no further action was required by DEQ (1999). A third spill occurred on March 3, 2004, when a conveyor belt broke in half and a gear box fell into the river.

Two releases from the TFA facility are documented by complaints received by DEQ (1999). Two complaints were received by DEQ on August 29, 1991 alleging that a caustic lube mixture was being discharged to a storm drain at the site (DEQ 1999). A second complaint received by DEQ (date unknown) noted that a gray-black material was discharging from an outfall onto the bank of the Willamette River near TFA; subsequent DEQ follow up inspection determined that the material appeared to contain graphite. An assessment of the storm drain system concluded that the outfall likely discharged drainage from drainage area 1 at the TFA facility (see Supplemental Figure 6), and that the graphite may have been the result of a one-time release from the facility. DEQ (1999) notes that this indicates a complete stormwater pathway from drainage area 1 to the Willamette River.

9. PHYSICAL SITE SETTING

The environmental investigations performed at the Front Avenue LP site include the following:

Parcel 1

- Dames & Moore (1977, 1982) and FSI (1983)
  - Completed geotechnical investigations in preparation for warehouse construction. Six soil boring were advanced and six test pits were completed to a maximum depth of 78 feet bgs.
- SE/E (1989a)
  - Completed a Phase I Environmental Assessment of Parcel 1 and a portion of Parcel 2.
- SE/E (1989b)
  - Completed a Phase II Environmental Assessment that included soil and groundwater sampling at areas of concern identified in the Phase I Environmental Assessment. Seven soil borings were advanced to a maximum of 40 feet bgs.
- SE/E (1990)
  - Excavation of petroleum-contaminated soil.

Parcel 2

- Crosby and Overton (unknown report date)
  - Excavation and removal of two Bunker C USTs and soil sampling of discovered

petroleum contamination. Maximum depth of exploration was 16 feet bgs.

- CWE (1989)
  - Completed a follow-up soil and groundwater investigation of contamination associated with the former Bunker C USTs. Four soil borings were advanced to an unknown depth in the immediate vicinity of the former location of the USTs
- NGS (1993, pers. comm.)
  - Completed an assessment of the validity of the laboratory analytical results from the CWE (1989) soil and groundwater investigation.
- EMCON (1993a)
  - Decommissioned an oil/water interceptor and collected samples from surrounding soil.
- EMCON (1993b)
  - Completed an analysis of waste materials present onsite, removal of waste materials, and sampling of soil from waste storage areas. Maximum depth of exploration was 5 feet bgs.

Parcel 3

- Dames & Moore (1977, 1982) and FSI (1983)
  - Completed geotechnical investigations in preparation for warehouse construction. Six soil boring were advanced and six test pits were completed to a maximum depth of 78 feet bgs.

The Front Avenue LP site is relatively flat, with elevations ranging from 32 to 40 feet relative to the City of Portland datum. Notable areas of relief on the site are a bermed area between Parcel 1 and Parcel 2, and piles of aggregate and sand (raw materials for concrete production) present on Parcel 1. The river bank is armored primarily with slag from the former Oregon Steel Mills operations (MFA 2002).

9.1 Geology

The historical Guilds Lake was located to the southwest of the site and was filled sometime in the early 1900s to provide industrial land. The former shoreline at the Front Avenue LP site generally corresponded with the northeastern edge of Parcel 2 [see Supplemental Figure 4 from MFA (2002)]. Parcel 1 and the northeastern half of Parcel 3 were created from 1940 to 1980 as the shoreline was extended riverward with material dredged from the Willamette River, slag from Oregon Steel mills, and construction debris (see Supplemental Figure 4).

The geology beneath the site is summarized from test pits and soil borings completed at the Front Avenue LP site. The near-surface geology at the site is dominated by the presence of Willamette River dredged material consisting of silt, silty sand, and sand with some significant areas containing slag material from the Oregon Steel Mills and construction debris (MFA 2002). The slag and construction debris are present primarily along the current shoreline and in the central portion of the site, which was the historic riverbank area. Based on the deep geotechnical borings, the thickness of the fill material ranges from 30 to 40 feet bgs. Underlying the fill material to a depth of 40 to 70 feet bgs are deposits of Quaternary alluvium consisting of silt, silty sand, and sand. The Quaternary alluvium is underlain either by gravels and cobbles representing coarse-grained Quaternary deposits and/or Pleistocene flood gravels or by the Columbia River Basalt (MFA 2002).

9.2 Hydrogeology

Available files do not indicate any permanent monitoring wells installed at the site. All documented groundwater information was obtained from temporary well points installed in soil borings. The majority of groundwater information at the property pertains to the shallow subsurface: the dredge fill and underlying alluvium to a depth of approximately 40 feet bgs (MFA 2002).

The uppermost groundwater zone at the site most likely occurs in the fill and alluvium (MFA 2002). Groundwater was first encountered at the site at depths ranging from 18 to 35 feet (SE/E 1989b). Site-specific information related to groundwater flow direction and hydraulic gradient is not available. Based on groundwater levels from monitoring wells at an adjacent property (McCall Oil & Chemical Corporation ECSI #134), the shallow groundwater flow direction is generally toward the Willamette River (MFA 2002). The groundwater regime in the lower coarse-grained Quaternary deposits and the Columbia River Basalt has not been evaluated.

Seep Locations. Front Avenue LP is located adjacent to the western shoreline of the Willamette River. A line of groundwater seeps was identified along the shoreline of Parcel 3 (CMI Northwest) during the 2002 Seep Reconnaissance Survey conducted by Groundwater Solution, Inc. The seep line was present below the high tide level where fine-grained sediment crops out at the base of the shoreline embankment (GSI 2003).

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations

☒ Yes ☐ No

Parcel 1

Based on results of a Phase I Environmental Site Assessment performed for Parcel 1 and the eastern portion of Parcel 2 in 1989 (prior to development by Lone Star Northwest), a Phase II ESA was performed in these two areas in 1989 (MFA 2002). Sample locations are shown in Supplemental Figures 4 and 5 from MFA (2002). Five surface soil samples were collected, and one composite sample was collected from each of seven borings advanced to 40 feet bgs. Discrete subsurface soil samples were also collected from select intervals (SE/E 1989b). All soil samples were analyzed for TPH and total metals, and certain samples analyzed for pesticides, PCBs, conventional parameters, or EP Toxicity metals (MFA 2002). In addition, one composite sample of slag material was collected from four randomly selected locations and analyzed for EP Toxicity metals and pH.

Diesel was the only petroleum hydrocarbon detected; concentrations ranged up to 6,030 mg/kg in surface soil. PCBs were not detected in surface samples but Aroclor 1248 was detected in a subsurface composite sample (collected near the area of the former pond) at up to 9 mg/kg. Pesticides were not detected in the one sample analyzed. The maximum concentrations of the 13 detected metals in soil were: antimony (34 mg/kg); arsenic (27 mg/kg); cadmium (18 mg/kg); chromium (2,120 mg/kg); chromium (III) (1,750 mg/kg); copper (882 mg/kg); lead (1,320 mg/kg); mercury (0.6 mg/kg); nickel (219 mg/kg); selenium (0.6 mg/kg); silver (4 mg/kg); thallium (2 mg/kg); and zinc (2,290 mg/kg). Subsurface soil pH ranged from 7.04 to 12.5 (SE/E 1989b). A soil removal was performed as a result of the TPH concentrations found, as discussed in Section 11.1 below. The results of the EP Toxicity metals analysis of the slag sample indicated low concentrations of barium and total chromium. The pH of the slag was 6.05 (SE/E 1989b). The material did not qualify as a hazardous waste (MFA 2002; SE/E 1989b).

Parcel 2

Samples collected in 1988 from the former Bunker C USTs excavation were analyzed for EPTOX metals, PCBs, and oil and grease. Only oil and grease was detected, at concentrations up to 5.3 percent (MFA 2002). This concentration is above the saturation limit for most soils and implies the presence of free product (DEQ 1999). Further sampling was conducted in February 1989 from four subsurface borings surrounding the former USTs; soil samples were analyzed for TPH, VOCs, and SVOCs. No constituents were detected in borings downgradient of the excavation. Oil and grease, acetone, and tetrachloroethene were detected at up to 25,288 mg/kg, 83 mg/kg, and 17 mg/kg, respectively, in a sample from 18 feet bgs in a boring approximately 20 feet southeast of the excavation [see Supplemental Figure 6 from MFA (2002)]. Chloroform and methylene chloride were detected at up to 31,000 mg/kg and 12,000 mg/kg, respectively, at 18 feet bgs in a boring approximately 50 feet southwest (MFA 2002). The oil and grease concentrations detected in this investigation are also consistent with the presence of free product (DEQ 1999). A number of tentatively identified VOC constituents (including alkanes, pentanes, or hexanes) and SVOC constituents (unidentified alkanes) were also reported in the soil samples (MFA 2002; DEQ 1999).

Soil sampling was subsequently performed by MOCC in 2001 to assess petroleum impacts on their property. Geoprobes were advanced on MOCC property adjacent to the former Bunker C USTs on Parcel 2. Gasoline (6,300 mg/kg), diesel (35,000 mg/kg), lube oil (38,000 mg/kg), LPAHs (255,100 mg/kg), and HPAHs (42,700 mg/kg) were detected in soil (MFA 2002). The UST file on the TFA site remains open, and additional sampling may be required to determine the source(s) and delineate the extent of impacts (DEQ 1999).

Soil sampling required by the DEQ SFO was performed in the spring of 1992 (MFA 2002). Soil samples were collected (at approximately 2 feet bgs) near the former battery storage area, former sandblast shed and shotblast grit (‘black sand’) pile, the former mandrel rack area (electrical motor storage area and craneway), current and former drum storage areas, low-carbon steel shavings pile, and process tank storage area (MFA 2002). Soil above asphalt was sampled near the waste oil AST, the former caustic tank, and the former steam-cleaning area. Sampling focused primarily on oil-stained areas, and TPH, PCBs, TCLP metals, VOCs and SVOCs were analyzed to characterize material for disposal (DEQ 1999; MFA 2002). TPH was detected in nearly all soil samples at concentrations ranging from 188 mg/kg near a low carbon steel pile, to 200,000 mg/kg near the mandrel rack (MFA 2002). VOCs were detected at up to 170 mg/kg (2-butanone), SVOCs were detected at up to 75 mg/kg [bis(2-ethylhexyl)phthalate], and PCBs (Aroclor 1260) were detected at 1 mg/kg in one sample. TCLP metals results indicated “potentially significant” concentrations of barium (up to 2.4 mg/kg), cadmium (up to 0.03 mg/kg), chromium (up to 0.1 mg/kg), and lead (up to 0.34 mg/kg; MFA 2002; DEQ 1999). DEQ noted that the TPH results indicate that free product may have been present at the steam-cleaning drain, the Mandrel rack area, and the former drum storage area (DEQ 1999). Excavations were performed subsequent to this sampling, as discussed in Section 11.1 below.

10.1.2. Riverbank Samples

☐ Yes ☒ No

No riverbank samples were described in the reports reviewed.

10.1.3. Summary

Historical minimum and maximum detected surface and subsurface constituent concentrations (in mg/kg unless otherwise noted) may be summarized as follows

	Surface				**Subsurface**	
	Parcel 1		**Parcel 2**		**Site Wide**	
	Min.	Max	Min.	Max.	Min.	Max.
TPH	NA	NA	64	200,000	NA	NA
Diesel	10U	6,300	10U	1680	20U	2,210

Heavy Oil	10U	10	10U	1430	10U	1,430
Oil and Grease	NA	NA	NA	NA	100U	25,288
Total antimony	NA	NA	10U	11	10U	34
	Surface				**Subsurface**	
	Parcel 1		**Parcel 2**		**Site Wide**	
Total arsenic	NA	NA	4	27	3	10
Total cadmium	NA	NA	1U	18	1U	5
Total chromium	NA	NA	20	604	24	2,120
Total copper	NA	NA	36	689	27	882
Total lead	NA	NA	28	656	21	1320
Total mercury	NA	NA	0.2U	0.3	0.2U	0.6
Total nickel	NA	NA	21	179	21	219
Total selenium	NA	NA	0.5U	1U	0.5U	0.7
Total silver	NA	NA	2U	2U	2U	4
Total thallium	NA	NA	1	3	1U	2
Total zinc	NA	NA	167	3,170	91	2,290
TCLP barium (mg/L)	NA	NA	0.5U	2.4	NA	NA
TCLP cadmium (mg/L)	NA	NA	0.01U	0.03	NA	NA
TCLP chromium (mg/L)	NA	NA	0.01U	0.1	NA	NA
TCLP lead (mg/L)	NA	NA	0.05U	0.34	NA	NA
TCLP silver (mg/L)	NA	NA	0.01U	0.02	NA	NA
2-butanone	NA	NA	10U	170	10U	10U
2-hexanone	NA	NA	10U	99	10U	10U
4-methyl-2-pentanone	NA	NA	10U	40	10U	10U
Acetone	NA	NA	50U	340	10U	83
Carbon disulfide	NA	NA	5U	25	5U	5U
Chloroform	NA	NA	1U	25U	1	31,000
Ethylbenzene	NA	NA	5U	7	5U	5U
Methylene chloride	NA	NA	10U	53	0.5	12,000
Styrene	NA	NA	1U	6	5U	5U
Tetrachloroethene	NA	NA	1U	25U	5U	17
Total xylenes	NA	NA	5U	36	5U	5U
Benzo(a)pyrene	NA	NA	0.3U	0.3	0.33U	0.5U
Benzo(b)fluoranthene	NA	NA	0.3U	0.4	0.33U	0.5U
Benzo(g,h,i)perylene	NA	NA	0.3U	0.4	0.33U	0.5U
Bis(2-ethylhexyl)phthalate	NA	NA	0.3U	75	0.33U	0.5U
Chrysene	NA	NA	0.3U	0.4	0.33U	0.5U
Fluoranthene	NA	NA	0.3U	0.9	0.33U	0.5U
Indeno(1,2,3-c,d)pyrene	NA	NA	0.3U	0.3	0.33U	0.5U
Phenanthrene	NA	NA	0.3U	0.9	0.33U	0.5U
Pyrene	NA	NA	0.3U	1	0.33U	0.5U
Aroclor 1248	NA	NA	1U	1U	1U	9
Aroclor 1260	NA	NA	1U	1	0.5U	1U

NA – Not Analyzed, U – Undetected at concentration shown

The diesel-contaminated soil identified in Parcel 1 prompted a removal action, as discussed in Section 11.1 below. Historical soil samples indicate that free product may be present in the subsurface near the former Bunker C USTs on Parcel 2. The UST file on the TFA site remains open, and additional sampling may be required to determine the source(s) and delineate the extent of impacts (DEQ 1999). DEQ noted that the TPH results indicate that free product may have been present at the steam-cleaning drain, the Mandrel rack area, and the former drum storage area (DEQ 1999). Excavations were performed subsequent to this sampling, as discussed in Section 11.1 below.

10.2. Groundwater

Groundwater investigations at the site since 1989 have included sampling groundwater from 11 temporary well points installed in soil probe borings advanced on Front Avenue LP Parcel 1 and Parcel 2. All the temporary well points were abandoned after groundwater samples were collected.

10.2.1. Groundwater Investigations ☒ Yes ☐ No

Sweet-Edwards/EMCON (SE/E) collected groundwater data from seven temporary well points installed at various locations in soil borings advanced during a 1989 Phase II ESA of Parcel 1 at Front Avenue LP (MFA 2002). The groundwater samples were analyzed for metals and TPH. Additional groundwater data were collected by Century West Engineering in 1989 from four temporary well points installed in soil borings advanced during an investigation of petroleum contamination associated with former USTs on Parcel 2 (MFA 2002). The groundwater samples were analyzed for TPH, VOCs, and SVOCs.

IT Corporation (2001) completed a soil and groundwater investigation along the shared property boundary of Front Avenue LP Parcel 2 and McCall Oil & Chemical Corporation (ESCI No. 134) in 2001 to assess the nature and extent of petroleum contamination (MFA 2002). Petroleum contamination was found near two former USTs on Parcel 2 at Front Avenue LP, however, potential contamination sources exist on the McCall Oil & Chemical Corporation property as well. As a result, the source of the petroleum contamination is disputed by Front Avenue LP and McCall Oil & Chemical Corporation (MFA 2002). Available files do not indicate resolution of this issue by the two parties or by DEQ.

Maul Foster & Alongi submitted a groundwater investigation work plan to DEQ in 2003 describing proposed soil and groundwater sampling for (1) evaluation of the groundwater discharge pathway to the Willamette River and (2) further evaluation of the former USTs on Parcel 2 (MFA 2003).

10.2.2. NAPL (Historic & Current) ☒ Yes ☐ No

Free product was noted by IT Corporation during a soil and groundwater investigation along the shared property boundary of Front Avenue LP Parcel 2 and McCall Oil & Chemical Corporation (ECSI #134) in 2001 [see Supplemental Figure 6 from MFA (2002)]. Additional soil and groundwater sampling at Front Avenue LP Parcel 2 was proposed in a groundwater investigation work plan delivered to DEQ (MFA 2003). Available files do not contain any subsequent records of activities.

10.2.3. Dissolved Contaminant Plumes ☒ Yes ☐ No

Shallow groundwater COIs include TPH, VOCs, SVOCs, PCBs, and metals. Limited groundwater data are available for the site; however, dissolved COIs have been detected in groundwater samples collected from Parcel 1 and Parcel 2 (no groundwater data have been collected at Parcel 3). Constituents historically detected in shallow groundwater include the following:

VOCs	SVOCs	TPH	Metals
1,2-dichloroethene	Dibutylphthalate Dimethylphthalate	Heavy oil	Various total metals have been detected; analyses for dissolved metals have not been completed.

Plume Characterization Status ☐ Complete ☒ Incomplete

No groundwater plume has been delineated at the site. However, groundwater data collected from the site indicate point detects of TPH on Parcel 1, and VOCs and SVOCs point detects on Parcel 2. In addition, a petroleum plume (including free product) was identified along the shared property boundary of Front Avenue LP Parcel 2 and McCall Oil & Chemical Corporation (ECSI #134) during a soil and groundwater investigation at McCall Oil & Chemical Corporation in 2001 (IT Corporation 2001). Available files do not have information on the extent of this petroleum plume.

Plume Extent

Available files do not identify a potential source of the VOCs, SVOCs, or TPH detected in groundwater. The single TPH detection was heavy-oil-range hydrocarbons, but the site investigation report (SE/E 1989b) indicated that inadequate sample volume remained after analyzing the lighter-range hydrocarbons to quantify the concentration of heavy range hydrocarbons.

A potential source of metals has been identified at the site: slag from the Oregon Steel Mills that was used or mixed with fill material at the site (MFA 2002). Concentrations of various metals have been detected in groundwater. The available files indicate that past analyses for metals have been for total metals and not dissolved metals.

As noted above petroleum-impacted groundwater (including free product) was identified along the shared property boundary of Front Avenue LP Parcel 2 and McCall Oil & Chemical Corporation (ESCI # 134) during a soil and groundwater investigation at McCall Oil & Chemical Corporation in 2001 (IT Corporation 2001).

Min/Max Detections (Current situation)

The available groundwater data were collected from temporary well points that were removed after groundwater samples were collected; therefore, each groundwater sampling location was sampled only once in 1989. The minimum and maximum detections in groundwater are provided in the following table.

Analyte	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)
Volatile Organic Compounds (VOCs)		
1,2-Dichloroethene	unknown detection limit	0.4
Semivolatile Organic Compounds (SVOCs)		
Dibutylphthalate	< 5	158
Dimethylphthalate	< 5	10
Total Petroleum Hydrocarbons (TPH)		
Heavy oil	unknown detection limit	concentration not quantified

Current Plume Data

No groundwater plume has been delineated at the site. However, groundwater sampling detected TPH in one temporary well on Parcel 1, and VOCs and SVOCs in one temporary well on Parcel 2. These detections are shown in Figure 2. In addition, a petroleum plume (including free product) was identified along the shared property boundary of Front Avenue LP Parcel 2 and McCall Oil & Chemical Corporation (ECSI #134) during a soil and groundwater investigation at McCall Oil & Chemical Corporation in 2001 (IT Corporation 2001). Available files do not have information on the extent of this petroleum plume.

Preferential Pathways

Available files indicate that stormwater lines are present beneath the site at Parcel 2 and Parcel 3 [see Supplemental Figures 6 and 7 from MFA (2002)]. However, no information has been presented regarding the depths of the utilities at the facility relative to the shallow groundwater table or if the utility and associated backfill may be a preferential pathway at the site.

Stormwater on Parcel 1 is managed by a system of seven onsite dry wells [see Supplemental Figure 5 from MFA (2002)]. The dry wells are regulated under WPCF 1000 permit and are registered with the DEQ's UIC program (wells 10521-1 through 10521-7) (MFA 2002). Available files do not contain information regarding the depths of the wells at the facility relative to the shallow groundwater table or if the wells may be a preferential pathway at the site.

Downgradient Plume Monitoring Points (min/max detections)

Groundwater samples were collected once from temporary wellpoints in 1989. No groundwater plume has been delineated at the site based upon the limited data.

Visual Seep Sample Data

☒ Yes ☐ No

A line of seeps was identified along the shoreline of Parcel 3 (CMI Northwest) during the Seep Reconnaissance Survey (GSI 2003). However, available records indicate no samples from the seeps have been collected.

Nearshore Porewater Data

Available files do not indicate that nearshore porewater data have been collected at the site.

Groundwater Plume Temporal Trend

Groundwater sampling is limited to one event at each of the 11 temporary well points installed at the site during 1989. No groundwater plume temporal trends were evaluated from the limited data set.

10.2.4. Summary

Groundwater investigations at the site since 1989 have included sampling groundwater from 11 temporary well points. VOCs (1,2-dichloroethene), SVOCs (dibutylphthalate and dimethylphthalate), and TPH (heavy-range hydrocarbons) have been detected in groundwater at the site. Available files do not identify a potential source of the VOCs, SVOCs, or TPH detected in groundwater.

Petroleum-impacted groundwater (including free product) was identified along the shared property boundary of Front Avenue LP Parcel 2 and McCall Oil & Chemical Corporation (ECSI #134) during a soil and groundwater investigation at McCall Oil & Chemical Corporation in 2001 (IT Corporation 2001). The source of the petroleum contamination is disputed by Front Avenue LP and McCall Oil & Chemical Corporation (MFA 2002).

Available files do not indicate resolution of this issue by the two parties or by DEQ.

No information has been presented regarding the depths of the utilities at the facility relative to the shallow groundwater table or if the utility and associated backfill may be a preferential pathway at the site.

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

See Section 5 for a general description of the site stormwater systems.

10.3.2. General or Individual Stormwater Permit (Current or Past) ☒ Yes ☐ No

Permit Type	File Number	Start Date	Outfalls	Parameters/Frequency
GEN 12Z	104856	11/5/97	WP-7	Standard[1/] twice yearly

[1] Standard GEN12Z permit requirements include pH, oil and grease, total suspended solids, copper, lead, and zinc. *E. coli* may also be required.

Do other non-stormwater wastes discharge to the system? ☐ Yes ☒ No

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☒ Yes ☐ No

A sediment sample was collected from a sump or former storm drain catch basin on Parcel 1 during the 1989 Phase II investigation, but the location is unclear (MFA 2002). Analytes included TPH, total metals, and PCBs. TPH and PCBs were not detected; antimony (24 mg/kg), arsenic (15 mg/kg), chromium (189 mg/kg), copper (332 mg/kg), lead (250 mg/kg), mercury (0.3 mg/kg), nickel (133 mg/kg), and zinc (761 mg/kg) were detected.

10.3.5. Wastewater Permit ☒ Yes ☐ No

Permit Type	Permit No.	Start Date	Outfalls	Volumes	Parameters/Frequency
GEN10	106127	6/30/98	7 Dry wells	Unknown	pH/weekly*

*Inspection of dikes, containment system, pond freeboard daily when operating and monthly when not operating. Inspect all adjacent streams for seepage three times/week (different times of day) when operating.

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

Each parcel has its own stormwater management system. Parcel 1 drains to a system of “dry wells.” A former ‘settling pond’ once existed on this parcel that is thought to have possibly been part of the stormwater drainage system for Parcel 2 (i.e., the former pond may have drained to the river), and included an outfall easement to the river. An observed release of graphite from the Tube Forgings of America (TFA) facility to outfall WR-7 on the Willamette River is evidence that the stormwater pathway for sources on Parcel 2 may be complete (DEQ 1999). A complete pathway for sources on Parcel 3 has not been confirmed, though site pavement is said to be designed to direct all runoff to the storm drains (MFA 2002).

10.4. Sediment

10.4.1. River Sediment Data ☒ Yes ☐ No

Sediment sampling locations in the vicinity of the Front Avenue LP site are shown on

Figure 1. A total of six surface samples (sample intervals ranging between 0 – 15 cm below the mudline) and two cores (from depths ranging up to 365 cm below mudline) were collected adjacent to the site. EPA collected three surface samples and one core adjacent to the site as part of the Portland Harbor Sediment Investigation in 1998 (Weston 1998), the City of Portland collected three surface samples near OF-19 and OF-19A in 2002 (CH2M Hill 2004), and one core was collected in the navigation channel near the site as part of a USACE (1998) survey. The surface sediment chemical data are summarized in Table 2.

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

Parcel 1

Shallow soil hydrocarbon contamination identified in the Phase 2 investigation led to the excavation of impacted soil in late 1989 and early 1990 (MFA 2002). Two areas near a former concrete slab were excavated (SE/E 1990). Diesel was detected at up to 1,680 mg/kg (MFA 2002). The excavation continued until confirmation samples indicated diesel concentrations in remaining soil were below 500 mg/kg (SE/E 1990). Approximately 100 cubic yards of material (consisting primarily of slag with some sand, silt, sand blast residue, ash, timbers, graphite, and metal pipes) was excavated from up to approximately 11 feet bgs, and disposed of at St. John's Landfill in Portland [see Supplemental Figure 6 from MFA (2002); SE/E 1990]. No mention was made as to whether groundwater was encountered during the excavation.

Parcel 2

Soil from approximately 11 discrete areas investigated as part of the SFO agreement were excavated to depths ranging from 1 foot to 5 feet bgs in December 1992 [see Supplemental Figure 6 from MFA (2002)]. Confirmation sample analyses were limited to TPH-diesel although cleanup levels for selected metals, VOCs, and SVOCs (detected in previous site samples) had been established in the work plan (DEQ 1999). One confirmation sample was collected from each excavation to confirm remaining soil contained less than 500 mg/kg diesel (DEQ 1999). The excavated areas correspond to the following potential source areas on Table 1: former steam-cleaning area; former waste oil tank; mandrel rack; electrical motor storage; current drum storage (and area 20 feet west); former drum storage; former battery storage area; former shot blast material pile; former low carbon steel pile; former process tank location.

11.2. Groundwater Cleanup/Source Control

There is no history of groundwater cleanup or groundwater source control at Front Avenue LP.

11.3. Other

The Smith oil/water interceptor system located near the steam-clean area at the TFA facility (see Supplemental Figure 6) was decommissioned in October 1992. Soil samples were collected below the oil/water separator-connecting pipe, below the interceptor system, next to the interceptor system, and below the process tank (MFA 2002). Samples were also collected of water in the drainpipe and sludge and liquid from the interceptor. The samples were analyzed for various analytes, including TPH, VOCs, SVOCs, metals, PCBs, or TSS. TPH (up to 312 mg/kg) and methylene chloride (up to 12 mg/kg) were detected in the soil. Soil below the system included chromium (18 mg/kg), copper (30 mg/kg), nickel (20 mg/kg), and zinc (91 mg/kg). No metals were detected in TCLP analysis of the soil samples. Soil below the sewer pipe was deemed a hazardous waste based on the TPH concentration (MFA 2002). TPH, VOCs, and metals were detected in the sludge and/or fluid samples, and the detection limits on undetected constituents were elevated (MFA 2002).

The sludge and fluids from the system were disposed of properly (MFA 2002). Subsequent dye tests confirmed that the former system had been connected to the City of Portland sanitary sewer (MFA 2002).

11.4. Potential for Recontamination from Upland Sources

See CSM Final Update.

12. BIBLIOGRAPHY / INFORMATION SOURCES

References cited:

CH2M Hill. 2004. Source Control Sediment Investigation for the City of Portland Outfalls. Prepared for the City of Portland, Portland, OR. CH2M Hill, Portland, OR.

Crosby and Overton (unknown date, *not seen, as cited in MFA 2002).*

CWE. 1989. Report of Findings, Environmental Investigation, Tank Removal Site, 5200 NW Front Avenue, Portland, Oregon. Prepared for Tube Forgings of America. Century West Engineering Corporation, Portland, OR. (*not seen, as cited in MFA 2002*)

Dames & Moore. 1977. Preliminary Soils Investigation, Proposed Warehouse Development, Old Oregon Steel mill Site, Portland, Oregon. Prepared for Gilmore Steel Corporation Pension Trust. Dames & Moore, Portland, OR. (*not seen, as cited in MFA 2002*)

Dames & Moore. 1982. Preliminary Soils Investigation, Proposed Warehouse Development, Old Oregon Steel mill Site, Portland, Oregon. Prepared for Gilmore Steel Corporation Pension Trust. Dames & Moore, Portland, OR. (*not seen, as cited in MFA 2002*)

DEQ. 1999. DEQ Site Assessment Program Strategy Recommendation: Front LP Properties. Oregon Department of Environmental Quality, Portland, OR.

DEQ. 2004a. DEQ Site Summary Report – Details for Site ID 2378. DEQ Environmental Cleanup Site (ECSI) Database. Accessed May 13, 2004. www.deq.state.or.us/wmc/ecsi/ecsidetail.asp?seqnbr=2378.

DEQ. 2004b. DEQ Site Summary Report – Details for Site ID 1239. DEQ Environmental Cleanup Site (ECSI) Database. Accessed May 13, 2004. www.deq.state.or.us/wmc/ecsi/ecsidetail.asp?seqnbr=1239.

EMCON. 1993a. Tube Forgings of America Oil/Water Interceptor System Decommissioning and Removal. April 2, 1993. Prepared for Tube Forgings of America. EMCON Northwest, Portland, OR (*not seen, as cited in MFA 2002*)

EMCON. 1993b. Removal of Petroleum-Hydrocarbon-Impacted Soil. Prepared for Tube Forgings of America. October 5, 1993. EMCON Northwest, Inc., Portland, OR. (*not seen, as cited in MFA 2002*)

FSI. 1983. Subsurface Investigation – Zidel Resources TFA Site, Portland, Oregon. May 25, 1983. Prepared for Zidel Resources, Inc. of Portland, Oregon. Foundation Sciences, Inc., Portland, OR. (*not seen, as cited in MFA 2002*)

GSI. 2003. Technical Memorandum: Results of Seep Reconnaissance Survey, River Mile 22-10.5, Lower Willamette River. Groundwater Solutions, Inc., Portland, OR.

Integral and DEA. 2004. Lower Willamette River February 2004 Multibeam Bathymetric Survey Report. Draft. Prepared for Lower Willamette Group, Portland, OR. Prepared by Integral Consulting, Inc., Mercer Island, WA, and David Evans and Associates, Inc., Portland, OR.

Integral, Windward, Kennedy/Jenks, Anchor Environmental, and Groundwater Solutions. 2004. Portland Harbor RI/FS Programmatic Work Plan. Prepared for the Lower Willamette Group, Portland, OR. Integral Consulting, Inc., Mercer Island, WA.

IT Corporation. 2001. Focused Remedial Investigation Interim Status Report, McCall Oil and Chemical Corporation, Portland, Oregon. April 30, 2001. Prepared for McCall oil and Chemical Corporation, Portland, OR. IT Corporation, Portland, OR. (*not seen, as cited in MFA 2002*)

MFA. 2002. Preliminary Assessment of Front Avenue LP Site, 4950, 5034, & 5200 NW Front Avenue, Portland, Oregon. ECSI No. 1239. June 20, 2002. Prepared for Front Avenue Limited Partnership. Maul Foster & Alongi, Inc., Vancouver, WA.

MFA. 2003. Groundwater Investigation Work Plan, Front Avenue LP Site. October 3, 2003. Prepared for Front Avenue Corporation. Maul Foster & Alongi, Inc., Vancouver, WA.

NGS. 1993. Personal communication (letter of 2/16/93 to T. Lindley, Miller Nash, Weiner, Hager & Carlsen, from D.F. (Rick) Kienle, NGS, regarding a review of LUST Mitigation, Tube Forgings of America, 5200 NW Front Street, Portland Oregon, Oregon DEQ LUST No. 26-88-116). Northwest Geological Services. (*not seen, as cited in MFA 2002*)

Oregon Steel Mills. 1968. Drawing “Property at 5200 NW Front, Oregon Steel Mills.” Revised June 3, 1968.

SE/E. 1989a. Zidell Phase I Environmental Assessment. Prepared for Stoel Rives Boly Jones and Grey, Portland, Oregon. Sweet-Edwards/EMCON, Inc., Kelso, WA.

SE/E. 1989b. Final Report, Phase II Environmental Site Assessment, Zidell Property. Prepared for Stoel Rives Boley Jones & Grey. Sweet-Edwards/Emcon, Inc., Kelso, WA.

SE/E. 1990. Soil Removal Report, Zidell Property, Front Avenue, Portland, Oregon. Prepared for Zidell. Sweet-Edwards/Emcon, Inc., Kelso, WA.

USACE. 1998. Willamette River Raw Data, 1986 – 1998. U.S. Army Corps of Engineers, Portland, OR.

Weston. 1998. Portland Harbor Sediment Investigation Report. Prepared for U.S. Environmental Protection Agency. Roy F. Weston, Inc., Portland, OR.

Figures:

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

Tables:

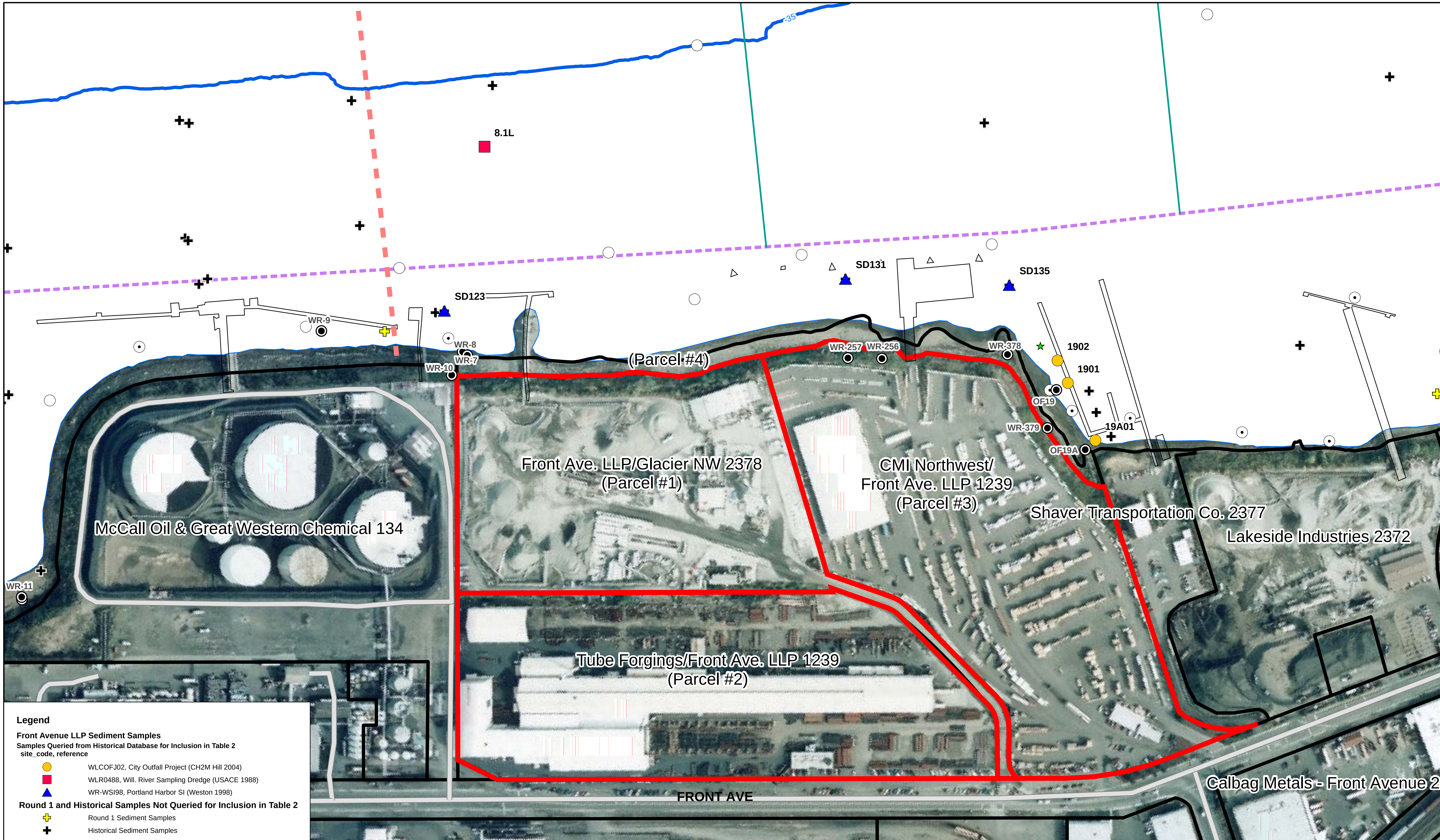
Table 1. Potential Sources and Sediment Transport Pathways
Table 2. Queried Sediment Chemistry Data

Supplemental Scanned Figures:

Figure 4. Chronology of Fill Placement (1897 to Present) (MFA 2002)
Figure 5. Parcel 1 – Glacier Northwest Site Layout (MFA 2002)
Figure 6. Parcel 2 – Tube Forgings of America Site Layout (MFA 2002)
Figure 7. Parcel 3 – CMI Northwest Site Layout (MFA 2002)

FIGURES

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater



integral

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations_3rd_Group.mxd)
Plot Date: 08/30/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

Outfall information contained on this map is accurate according to available records; however, the City of Portland makes no warranty, expressed or implied, as to the completeness or accuracy of the information published (updated June 2005).

Legend

- Outfalls
- Seep Photo Location (Not location of actual Seep)
- Selected ECSI Site Property Boundary
- Navigation Channel
- Docks & In-water Structures
- River Miles
- -35ft. Contour (NAVD 88)

Human Use Areas

- Dockside Worker
- Recreational Beach Use
- Transient

LWG Round 2 Proposed Sediment Samples

- Surface Sample Only
- Core & Surface Sample

0 50 100 200 Feet

DRAFT

DO NOT QUOTE OR CITE. This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Front Avenue LLP
ECSI 1239

DRAFT

Groundwater Solutions Inc.

LWG
LOWER WILLAMETTE GROUP

0 200 400 Feet

FEATURE SOURCES:
Transportation, Water, Property, Zoning or Boundaries: Metro RLIS.
ECSI site locations were summarized in December, 2002
and January, 2003 from ODEQ ECSI files.

Map Creation Date: August 11, 2004

File Name: Fig2_FrontAve_SummaryMap.mxd

LEGEND

Site Boundary

Contaminant Type

Petroleum related

SVOC (bis(2-ethylhexyl)phthalate)

VOCs

Extent of Impacted Groundwater

For details, refer to plume interpretation table in CSM document.

Single or isolated detection of COI's. Extent or continuity of impacted groundwater between sample points is uncertain. Color based on contaminant type.

Estimated extent of impacted groundwater area. Color based on contaminant type.

Figure 2
Portland Harbor RI/FS
Front Avenue LP Properties
Upland Groundwater Quality Overview

DO NOT QUOTE OR CITE:
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part.

TABLES

Table 1. Potential Sources and Sediment Transport Pathways
Table 2. Queried Sediment Chemistry Data

Front Avenue LP Properties #1239

Table 1. Potential Sources and Transport Pathways Assessment

Potential Sources	Media Impacted					COIs																Potential Complete Pathway				
							TPH			VOCs																
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	TPH	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																										
Steel mill slag fill material	✓	✓	?		?												✓					?	✓	?		?
Parcel 1																										
Maintenance shop operations	?	?	?	?	?																	?	?			?
20,000-gallon diesel AST								✓														?	?			
275-gallon motor oil, hydraulic oil, and used oil ASTs									✓	✓			✓	✓			✓					?	?			
Steam cleaning area	?	?	?	?	?	✓				✓	✓						✓*					?	?			
Former settling pond		✓	?		?													✓					?		?	
Parcel 2																										
Former Bunker C USTs and piping		✓	?		?				✓		✓												?			
TFA manufacturing and site operations											✓															
AST storage area	?	?	?	?	?																		?		?	
Current drum storage area	✓	?	?	?	?	✓				✓	✓		✓				✓*						?		?	
Former battery storage area	✓	?	?	?	?					✓	✓		✓				✓*						?		?	
Former caustic (methylene chloride) tank	✓	?	?	?	?							✓											?		?	
Former drum storage area	✓	?	?	?	?	✓					✓		✓				✓*						?		?	
Former process tank storage area	✓	?	?	?	?	✓					✓		✓				✓*	✓					?		?	
Former sand blast shed/shot blast material	✓	?	?	?	?	✓				✓	✓		✓				✓*						?		?	
Former Smith OWS	✓	✓	?	?	?	✓				✓	✓												?		?	
Former steam cleaning area	✓	?	?	?	?	✓				✓	✓						✓*						?		?	
Former waste oil tank	✓	?	?	?	?	✓																	?		?	
Low carbon steel shavings pile	✓	?	?	?	?	✓					✓		✓				✓*						?		?	
Mandrel rack /electrical motor storage area	✓	?	?	?	?	✓				✓	✓		✓				✓*						?		?	
Mandrel rack and craneway	✓	?	?	?	?	✓					✓						✓*						?		?	
Current or historical transformers	?	?	?	?	?				✓									✓					?		✓	
Historic steel mill air emissions	?			?	?												✓					?			?	
Railroad spur	?	?	?	?	?			✓	✓									?					?		?	
Parcel 3																										
Vehicle maintenance operations	?	?	?	?	?	✓							✓									?	?		?	
Diesel AST	?	?	?	?	?			✓														?	?		?	
Railroad spur	?	?	?	?	?			✓	✓														?		?	
Overwater Areas																										
Delivery vessel operations					?			✓	✓															?		
Other Areas/Other Issues																										

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST Underground storage tank
AST Above-ground storage tank
TPH Total petroleum hydrocarbons
VOCs Volatile organic compounds
SVOCs Semivolatile organic compounds
PAHs Polycyclic aromatic hydrocarbons
BTEX Benzene, toluene, ethylbenzene, and xylenes
PCBs Polychorinated biphenols
* TCLP data indicate leachable metals in soil (MFA 2002).
? Unknown

Table 2. Queried Sediment Chemistry Data.

Surface or				N	%	Detected Concentrations					Detected and Nondetected Concentrations				
Subsurface	Analyte	Units	N	Detected	Detected	Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Total organic carbon	(%)	6	6	100	1	3.69	1.99	1.5	2.99	1	3.69	1.99	1.5	2.99
subsurface	Total organic carbon	(%)	2	2	100	1.7	1.73	1.72	1.7	1.7	1.7	1.73	1.72	1.7	1.7
subsurface	Total volatile solids	(%)	1	1	100	8.92	8.92	8.92	8.92	8.92	8.92	8.92	8.92	8.92	8.92
surface	Gravel	(%)	2	2	100	0.09	0.1	0.095	0.09	0.09	0.09	0.1	0.095	0.09	0.09
surface	Sand	(%)	3	3	100	23.28	33.92	27.1	24	24	23.28	33.92	27.1	24	24
surface	Fines	(%)	3	3	100	65.98	76.63	72.9	76	76	65.98	76.63	72.9	76	76
surface	Silt	(%)	3	3	100	58.52	68.68	64.2	65.48	65.48	58.52	68.68	64.2	65.48	65.48
surface	Clay	(%)	3	3	100	7.46	10.52	8.64	7.95	7.95	7.46	10.52	8.64	7.95	7.95
subsurface	Gravel	(%)	1	1	100	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
subsurface	Sand	(%)	2	2	100	9.8	21.48	15.6	9.8	9.8	9.8	21.48	15.6	9.8	9.8
subsurface	Fines	(%)	2	2	100	78.45	90.2	84.3	78.45	78.45	78.45	90.2	84.3	78.45	78.45
subsurface	Silt	(%)	2	2	100	65.01	73.7	69.4	65.01	65.01	65.01	73.7	69.4	65.01	65.01
subsurface	Clay	(%)	2	2	100	13.44	16.5	15	13.44	13.44	13.44	16.5	15	13.44	13.44
subsurface	Mean grain size	(mm)	1	1	100	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
subsurface	Median grain size	(mm)	1	1	100	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
surface	Dalapon	(ug/kg)	2	0	0						1.57 U	1.62 U	1.6	1.57 U	1.57 U
surface	Dicamba	(ug/kg)	2	0	0						1.61 U	1.65 U	1.63	1.61 U	1.61 U
surface	MCPA	(ug/kg)	2	0	0						3.07 U	3.16 U	3.12	3.07 U	3.07 U
surface	Dichloroprop	(ug/kg)	2	0	0						2.59 U	2.67 U	2.63	2.59 U	2.59 U
surface	2,4-D	(ug/kg)	2	0	0						2.72 U	2.8 U	2.76	2.72 U	2.72 U
surface	Silvex	(ug/kg)	2	0	0						2.62 U	2.7 U	2.66	2.62 U	2.62 U
surface	2,4,5-T	(ug/kg)	2	0	0						3.21 U	3.3 U	3.26	3.21 U	3.21 U
surface	2,4-DB	(ug/kg)	2	0	0						1.96 U	2.02 U	1.99	1.96 U	1.96 U
surface	Dinoseb	(ug/kg)	2	0	0						2.25 U	2.31 U	2.28	2.25 U	2.25 U
surface	MCPP	(ug/kg)	2	0	0						1.37 U	1.41 U	1.39	1.37 U	1.37 U
surface	Aluminum	(mg/kg)	6	6	100	15400	37400	26700	21500	36600	15400	37400	26700	21500	36600
surface	Antimony	(mg/kg)	6	4	66.7	1.32	13	5.91	4.33	5 J	1.32	13	5.61	5 UJ	5 UJ
surface	Arsenic	(mg/kg)	6	3	50	3.88	23.3	10.9	5.65	5.65	3.88	23.3	7.97	5 U	5.65
surface	Cadmium	(mg/kg)	6	6	100	0.395	2.82	0.978	0.4	1.35	0.395	2.82	0.978	0.4	1.35
surface	Chromium	(mg/kg)	6	6	100	31.4	774	158	33.7	44.2	31.4	774	158	33.7	44.2
surface	Copper	(mg/kg)	6	6	100	37.3	772 B	210	41.5	266 B	37.3	772 B	210	41.5	266 B
surface	Lead	(mg/kg)	6	6	100	14	350 B	113	20	187 B	14	350 B	113	20	187 B
surface	Manganese	(mg/kg)	3	3	100	505	631	559	542	542	505	631	559	542	542
surface	Mercury	(mg/kg)	6	6	100	0.05	0.796	0.281	0.06	0.417	0.05	0.796	0.281	0.06	0.417
surface	Nickel	(mg/kg)	6	6	100	23.2 B	153 B	50.6	28	45 B	23.2 B	153 B	50.6	28	45 B
surface	Selenium	(mg/kg)	6	3	50	9	10	9.33	9	9	0.119 U	10	4.8	0.534 U	9
surface	Silver	(mg/kg)	6	6	100	0.445 B	3.73	1.18	0.695 B	0.9	0.445 B	3.73	1.18	0.695 B	0.9
surface	Thallium	(mg/kg)	3	3	100	6	10	8.33	9	9	6	10	8.33	9	9
surface	Zinc	(mg/kg)	6	6	100	97.2	1320 B	376	126	397 B	97.2	1320 B	376	126	397 B
surface	Barium	(mg/kg)	3	3	100	157	170	165	168	168	157	170	165	168	168
surface	Beryllium	(mg/kg)	3	3	100	0.53	0.59	0.56	0.56	0.56	0.53	0.59	0.56	0.56	0.56
surface	Calcium	(mg/kg)	3	3	100	7310	8050	7700	7730	7730	7310	8050	7700	7730	7730

Table 2. Queried Sediment Chemistry Data.

Surface or				N	%	Detected Concentrations					Detected and Nondetected Concentrations				
Subsurface	Analyte	Units	N	Detected	Detected	Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Cobalt	(mg/kg)	3	3	100	15.8	17.8	17	17.4	17.4	15.8	17.8	17	17.4	17.4
surface	Iron	(mg/kg)	3	3	100	35700	38700	37700	38700	38700	35700	38700	37700	38700	38700
surface	Magnesium	(mg/kg)	3	3	100	6120	6820	6540	6670	6670	6120	6820	6540	6670	6670
surface	Potassium	(mg/kg)	3	3	100	1110	1120	1110	1110	1110	1110	1120	1110	1110	1110
surface	Sodium	(mg/kg)	3	3	100	924 J	1080 J	988	959 J	959 J	924 J	1080 J	988	959 J	959 J
surface	Vanadium	(mg/kg)	3	3	100	87.5	94.3	92	94.2	94.2	87.5	94.3	92	94.2	94.2
subsurface	Aluminum	(mg/kg)	1	1	100	40900	40900	40900	40900	40900	40900	40900	40900	40900	40900
subsurface	Antimony	(mg/kg)	1	0	0						5 UJ	5 UJ	5	5 UJ	5 UJ
subsurface	Arsenic	(mg/kg)	1	0	0						5 U	5 U	5	5 U	5 U
subsurface	Cadmium	(mg/kg)	1	1	100	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
subsurface	Chromium	(mg/kg)	1	1	100	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7
subsurface	Copper	(mg/kg)	1	1	100	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7
subsurface	Lead	(mg/kg)	1	1	100	32	32	32	32	32	32	32	32	32	32
subsurface	Manganese	(mg/kg)	1	1	100	658	658	658	658	658	658	658	658	658	658
subsurface	Mercury	(mg/kg)	1	1	100	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
subsurface	Nickel	(mg/kg)	1	1	100	30.2	30.2	30.2	30.2	30.2	30.2	30.2	30.2	30.2	30.2
subsurface	Selenium	(mg/kg)	1	1	100	8	8	8	8	8	8	8	8	8	8
subsurface	Silver	(mg/kg)	1	1	100	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
subsurface	Thallium	(mg/kg)	1	1	100	6	6	6	6	6	6	6	6	6	6
subsurface	Zinc	(mg/kg)	1	1	100	181	181	181	181	181	181	181	181	181	181
subsurface	Barium	(mg/kg)	1	1	100	197	197	197	197	197	197	197	197	197	197
subsurface	Beryllium	(mg/kg)	1	1	100	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
subsurface	Calcium	(mg/kg)	1	1	100	8590	8590	8590	8590	8590	8590	8590	8590	8590	8590
subsurface	Cobalt	(mg/kg)	1	1	100	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9
subsurface	Iron	(mg/kg)	1	1	100	41400	41400	41400	41400	41400	41400	41400	41400	41400	41400
subsurface	Magnesium	(mg/kg)	1	1	100	7220	7220	7220	7220	7220	7220	7220	7220	7220	7220
subsurface	Potassium	(mg/kg)	1	1	100	1310	1310	1310	1310	1310	1310	1310	1310	1310	1310
subsurface	Sodium	(mg/kg)	1	1	100	1110 J	1110 J	1110	1110 J	1110 J	1110 J	1110 J	1110	1110 J	1110 J
subsurface	Vanadium	(mg/kg)	1	1	100	108	108	108	108	108	108	108	108	108	108
surface	2-Methylnaphthalene	(ug/kg)	6	3	50	60.3 J	314 J	185	182 J	182 J	19 U	314 J	103	20 U	182 J
surface	Acenaphthene	(ug/kg)	6	3	50	72 J	508 J	277	251 J	251 J	19 U	508 J	148	20 U	251 J
surface	Acenaphthylene	(ug/kg)	6	2	33.3	34.6 J	197 J	116	34.6 J	34.6 J	19 U	197 J	52.2	20 U	34.6 J
surface	Anthracene	(ug/kg)	6	4	66.7	20	892 J	342	97.2 J	357 J	19 U	892 J	234	20 U	357 J
surface	Fluorene	(ug/kg)	6	3	50	79.1 J	766 J	353	215 J	215 J	19 U	766 J	187	20 U	215 J
surface	Naphthalene	(ug/kg)	6	3	50	78.6 J	269 J	189	220 J	220 J	19 U	269 J	104	20 U	220 J
surface	Phenanthrene	(ug/kg)	6	6	100	33	2170 J	627	71	1060 J	33	2170 J	627	71	1060 J
surface	Low Molecular Weight PAH	(ug/kg)	6	6	100	33 A	4556 A	1300	71 A	2349 A	33 A	4556 A	1300	71 A	2349 A
surface	Dibenz(a,h)anthracene	(ug/kg)	6	2	33.3	166 J	221 J	194	166 J	166 J	18.2 UJ	221 J	77.4	20 U	166 J
surface	Benz(a)anthracene	(ug/kg)	6	6	100	20	1210 J	382	34	850 J	20	1210 J	382	34	850 J
surface	Benzo(a)pyrene	(ug/kg)	6	6	100	20	905 J	309	46	735 J	20	905 J	309	46	735 J
surface	Benzo(b)fluoranthene	(ug/kg)	3	3	100	21	41	34	40	40	21	41	34	40	40
surface	Benzo(g,h,i)perylene	(ug/kg)	6	5	83.3	28	666 J	273	86 J	554 J	19 U	666 J	230	29	554 J

Table 2. Queried Sediment Chemistry Data.

Surface or				N	%	Detected Concentrations					Detected and Nondetected Concentrations				
Subsurface	Analyte	Units	N	Detected	Detected	Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Benzo(k)fluoranthene	(ug/kg)	3	3	100	19	33	27	29	29	19	33	27	29	29
surface	Chrysene	(ug/kg)	6	6	100	41	1290 J	424	60	870 J	41	1290 J	424	60	870 J
surface	Fluoranthene	(ug/kg)	6	6	100	55	2980 J	828	98	1340 J	55	2980 J	828	98	1340 J
surface	Indeno(1,2,3-cd)pyrene	(ug/kg)	6	5	83.3	24	620 J	241	70.8 J	466 J	19 U	620 J	204	24	466 J
surface	Pyrene	(ug/kg)	6	6	100	46	2870 J	860	79	1680 J	46	2870 J	860	79	1680 J
surface	Benzo(b+k)fluoranthene	(ug/kg)	6	6	100	40 A	1450 J	501	73 A	1140 J	40 A	1450 J	501	73 A	1140 J
surface	High Molecular Weight PAH	(ug/kg)	6	6	100	222 A	12212 A	3800	438 A	7801 A	222 A	12212 A	3800	438 A	7801 A
surface	Polycyclic Aromatic Hydrocarbons	(ug/kg)	6	6	100	255 A	16768 A	5100	509 A	10150 A	255 A	16768 A	5100	509 A	10150 A
subsurface	2-Methylnaphthalene	(ug/kg)	1	1	100	54	54	54	54	54	54	54	54	54	54
subsurface	Acenaphthene	(ug/kg)	1	1	100	28	28	28	28	28	28	28	28	28	28
subsurface	Acenaphthylene	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Anthracene	(ug/kg)	1	1	100	27	27	27	27	27	27	27	27	27	27
subsurface	Fluorene	(ug/kg)	1	1	100	29	29	29	29	29	29	29	29	29	29
subsurface	Naphthalene	(ug/kg)	1	1	100	84	84	84	84	84	84	84	84	84	84
subsurface	Phenanthrene	(ug/kg)	1	1	100	200	200	200	200	200	200	200	200	200	200
subsurface	Low Molecular Weight PAH	(ug/kg)	1	1	100	368 A	368 A	368	368 A	368 A	368 A	368 A	368	368 A	368 A
subsurface	Dibenz(a,h)anthracene	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Benz(a)anthracene	(ug/kg)	1	1	100	57	57	57	57	57	57	57	57	57	57
subsurface	Benzo(a)pyrene	(ug/kg)	1	1	100	72	72	72	72	72	72	72	72	72	72
subsurface	Benzo(b)fluoranthene	(ug/kg)	1	1	100	64	64	64	64	64	64	64	64	64	64
subsurface	Benzo(g,h,i)perylene	(ug/kg)	1	1	100	65	65	65	65	65	65	65	65	65	65
subsurface	Benzo(k)fluoranthene	(ug/kg)	1	1	100	54	54	54	54	54	54	54	54	54	54
subsurface	Chrysene	(ug/kg)	1	1	100	95	95	95	95	95	95	95	95	95	95
subsurface	Fluoranthene	(ug/kg)	1	1	100	200	200	200	200	200	200	200	200	200	200
subsurface	Indeno(1,2,3-cd)pyrene	(ug/kg)	1	1	100	47	47	47	47	47	47	47	47	47	47
subsurface	Pyrene	(ug/kg)	1	1	100	240	240	240	240	240	240	240	240	240	240
subsurface	Benzo(b+k)fluoranthene	(ug/kg)	1	1	100	118 A	118 A	118	118 A	118 A	118 A	118 A	118	118 A	118 A
subsurface	High Molecular Weight PAH	(ug/kg)	1	1	100	894 A	894 A	894	894 A	894 A	894 A	894 A	894	894 A	894 A
subsurface	Polycyclic Aromatic Hydrocarbons	(ug/kg)	1	1	100	1262 A	1262 A	1260	1262 A	1262 A	1262 A	1262 A	1260	1262 A	1262 A
surface	2,4'-Dichlorobiphenyl	(ug/kg)	3	1	33.3	10.1	10.1	10.1	10.1	10.1	0.4 U	10.1	3.64	0.41 UP	0.41 UP
surface	2,2',5-Trichlorobiphenyl	(ug/kg)	3	3	100	0.55 JP	17.5 P	6.48	1.4 P	1.4 P	0.55 JP	17.5 P	6.48	1.4 P	1.4 P
surface	2,4,4'-Trichlorobiphenyl	(ug/kg)	3	3	100	3.52	27.2	11.7	4.35	4.35	3.52	27.2	11.7	4.35	4.35
surface	2,2',3,5'-Tetrachlorobiphenyl	(ug/kg)	3	3	100	2.41	14.9	6.82	3.15	3.15	2.41	14.9	6.82	3.15	3.15
surface	2,2',5,5'-Tetrachlorobiphenyl	(ug/kg)	3	3	100	3.48	20.4	11.3	10 P	10 P	3.48	20.4	11.3	10 P	10 P
surface	2,3',4,4'-Tetrachlorobiphenyl	(ug/kg)	3	3	100	4.05 P	30.9 P	15	10.1	10.1	4.05 P	30.9 P	15	10.1	10.1
surface	2,2',4,5,5'-Pentachlorobiphenyl	(ug/kg)	3	3	100	4.48	8.48	5.87	4.64 P	4.64 P	4.48	8.48	5.87	4.64 P	4.64 P
surface	2,3,3',4,4'-Pentachlorobiphenyl	(ug/kg)	3	0	0						0.17 U	0.18 U	0.177	0.18 U	0.18 U
surface	2,3',4,4',5-Pentachlorobiphenyl	(ug/kg)	3	2	66.7	3.31	6.57	4.94	3.31	3.31	0.22 U	6.57	3.37	3.31	3.31
surface	2,2',3,3',4,4'-Hexachlorobiphenyl	(ug/kg)	3	3	100	1.02	6.68 P	2.97	1.21 P	1.21 P	1.02	6.68 P	2.97	1.21 P	1.21 P
surface	2,2',3,4,4',5'-Hexachlorobiphenyl	(ug/kg)	3	3	100	3.34 P	31.9 P	15.1	10.1	10.1	3.34 P	31.9 P	15.1	10.1	10.1
surface	2,2',4,4',5,5'-Hexachlorobiphenyl	(ug/kg)	3	2	66.7	6.44 P	8.46 P	7.45	6.44 P	6.44 P	0.26 U	8.46 P	5.05	6.44 P	6.44 P
surface	2,2',3,3',4,4',5-Heptachlorobiphenyl	(ug/kg)	3	2	66.7	1.54 P	1.76 P	1.65	1.54 P	1.54 P	0.2 U	1.76 P	1.17	1.54 P	1.54 P

Table 2. Queried Sediment Chemistry Data.

Surface or				N	%	Detected Concentrations					Detected and Nondetected Concentrations				
Subsurface	Analyte	Units	N	Detected	Detected	Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	2,2',3,4,4',5,5'-Heptachlorobiphenyl	(ug/kg)	3	2	66.7	3.93	4.87	4.4	3.93	3.93	0.18 U	4.87	2.99	3.93	3.93
surface	2,2',3,4',5,5',6-Heptachlorobiphenyl	(ug/kg)	3	2	66.7	3.96	4.61	4.29	3.96	3.96	0.22 U	4.61	2.93	3.96	3.96
surface	2,4'-DDD	(ug/kg)	3	3	100	3.78 J	42.5 J	23.3	23.6 J	23.6 J	3.78 J	42.5 J	23.3	23.6 J	23.6 J
surface	2,4'-DDE	(ug/kg)	3	2	66.7	4.88 J	7.87 J	6.38	4.88 J	4.88 J	3.24 UJ	7.87 J	5.33	4.88 J	4.88 J
surface	2,4'-DDT	(ug/kg)	3	0	0						2.65 UJ	7.22 UJ	4.37	3.24 UJ	3.24 UJ
surface	4,4'-DDD	(ug/kg)	3	1	33.3	5.3 J	5.3 J	5.3	5.3 J	5.3 J	0.515 UJ	7.22 UJ	4.35	5.3 J	5.3 J
surface	4,4'-DDE	(ug/kg)	3	3	100	7.54 J	24 J	14.1	10.7 J	10.7 J	7.54 J	24 J	14.1	10.7 J	10.7 J
surface	4,4'-DDT	(ug/kg)	3	2	66.7	10.5 J	17.3 J	13.9	10.5 J	10.5 J	0.838 UJ	17.3 J	9.55	10.5 J	10.5 J
surface	Total of 3 isomers: pp-DDT,-DDD,-DDE	(ug/kg)	3	3	100	12.84 A	34.5 A	25.1	28 A	28 A	12.84 A	34.5 A	25.1	28 A	28 A
surface	Aldrin	(ug/kg)	3	0	0						1.14 UJ	3.61 UJ	2.05	1.4 UJ	1.4 UJ
surface	alpha-Hexachlorocyclohexane	(ug/kg)	3	0	0						0.823 UJ	3.61 UJ	1.81	1.01 UJ	1.01 UJ
surface	beta-Hexachlorocyclohexane	(ug/kg)	3	0	0						1.12 UJ	3.61 UJ	2.03	1.37 UJ	1.37 UJ
surface	delta-Hexachlorocyclohexane	(ug/kg)	3	0	0						1.02 UJ	3.61 UJ	1.96	1.24 UJ	1.24 UJ
surface	gamma-Hexachlorocyclohexane	(ug/kg)	3	0	0						1.01 UJ	3.61 UJ	1.95	1.24 UJ	1.24 UJ
surface	cis-Chlordane	(ug/kg)	3	0	0						1.05 UJ	3.61 UJ	1.98	1.29 UJ	1.29 UJ
surface	trans-Chlordane	(ug/kg)	3	1	33.3	4.21 J	4.21 J	4.21	4.21 J	4.21 J	1.08 UJ	4.21 J	2.2	1.31 UJ	1.31 UJ
surface	Oxychlordane	(ug/kg)	3	0	0						2.65 UJ	7.22 UJ	4.37	3.24 UJ	3.24 UJ
surface	cis-Nonachlor	(ug/kg)	3	2	66.7	8.24 J	60.1 J	34.2	8.24 J	8.24 J	2.65 UJ	60.1 J	23.7	8.24 J	8.24 J
surface	trans-Nonachlor	(ug/kg)	3	0	0						2.65 UJ	7.22 UJ	4.37	3.24 UJ	3.24 UJ
surface	Dieldrin	(ug/kg)	3	2	66.7	1.72 J	27.8 J	14.8	1.72 J	1.72 J	0.869 UJ	27.8 J	10.1	1.72 J	1.72 J
surface	alpha-Endosulfan	(ug/kg)	3	1	33.3	6.53 J	6.53 J	6.53	6.53 J	6.53 J	1.13 UJ	6.53 J	3.01	1.38 UJ	1.38 UJ
surface	beta-Endosulfan	(ug/kg)	3	0	0						1.02 UJ	7.22 UJ	3.16	1.25 UJ	1.25 UJ
surface	Endosulfan sulfate	(ug/kg)	3	0	0						0.964 UJ	7.22 UJ	3.12	1.18 UJ	1.18 UJ
surface	Endrin	(ug/kg)	3	1	33.3	14.7 J	14.7 J	14.7	14.7 J	14.7 J	0.956 UJ	14.7 J	5.61	1.17 UJ	1.17 UJ
surface	Endrin aldehyde	(ug/kg)	3	0	0						1.08 UJ	7.22 UJ	3.21	1.32 UJ	1.32 UJ
surface	Endrin ketone	(ug/kg)	3	0	0						0.745 UJ	7.22 UJ	2.96	0.909 UJ	0.909 UJ
surface	Heptachlor	(ug/kg)	3	1	33.3	1.08 J	1.08 J	1.08	1.08 J	1.08 J	1.08 J	3.61 UJ	1.93	1.11 UJ	1.11 UJ
surface	Heptachlor epoxide	(ug/kg)	3	2	66.7	1.77 J	4.53 J	3.15	1.77 J	1.77 J	1.18 UJ	4.53 J	2.49	1.77 J	1.77 J
surface	Methoxychlor	(ug/kg)	3	0	0						3.65 UJ	36.1 UJ	14.7	4.46 UJ	4.46 UJ
surface	Toxaphene	(ug/kg)	3	0	0						16.6 UJ	361 UJ	133	20.3 UJ	20.3 UJ
surface	Chlordane (cis & trans)	(ug/kg)	3	0	0						3.73 UJ	36.1 UJ	14.8	4.55 UJ	4.55 UJ
surface	Diesel fuels	(mg/kg)	3	3	100	342	3790	1520	426	426	342	3790	1520	426	426
surface	Lube Oil	(mg/kg)	3	3	100	922	2310	1510	1290	1290	922	2310	1510	1290	1290
surface	2,3,4,6-Tetrachlorophenol	(ug/kg)	3	0	0						182 UJ	223 UJ	202	202 UJ	202 UJ
surface	2,4,5-Trichlorophenol	(ug/kg)	6	0	0						96 U	223 UJ	151	100 U	202 UJ
surface	2,4,6-Trichlorophenol	(ug/kg)	6	0	0						96 U	223 UJ	151	100 U	202 UJ
surface	2,4-Dichlorophenol	(ug/kg)	6	0	0						58 U	223 UJ	131	60 U	202 UJ
surface	2,4-Dimethylphenol	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	2,4-Dinitrophenol	(ug/kg)	6	0	0						190 U	1110 UJ	603	200 U	1010 UJ
surface	2-Chlorophenol	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	2-Methylphenol	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	2-Nitrophenol	(ug/kg)	6	0	0						96 U	223 UJ	151	100 U	202 UJ

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Units	N	N Detected	% Detected	Detected Concentrations Minimum	Detected Concentrations Maximum	Detected Concentrations Mean	Detected Concentrations Median	Detected Concentrations 95th	Detected and Nondetected Concentrations Minimum	Detected and Nondetected Concentrations Maximum	Detected and Nondetected Concentrations Mean	Detected and Nondetected Concentrations Median	Detected and Nondetected Concentrations 95th
surface	4,6-Dinitro-2-methylphenol	(ug/kg)	6	0	0						190 U	1110 UJ	603	200 U	1010 UJ
surface	4-Chloro-3-methylphenol	(ug/kg)	6	0	0						38 U	223 UJ	121	40 U	202 UJ
surface	4-Methylphenol	(ug/kg)	6	4	66.7	270	563 J	383	340	360	270	563 J	384	360	404 UJ
surface	4-Nitrophenol	(ug/kg)	8	0	0						1.56 U	1110 UJ	416	100 U	1010 UJ
surface	Pentachlorophenol	(ug/kg)	8	1	12.5	15.1	15.1	15.1	15.1	15.1	2.01 U	223 UJ	115	100 U	202 UJ
surface	Phenol	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	2,3,5,6-Tetrachlorophenol	(ug/kg)	3	0	0						182 UJ	223 UJ	202	202 UJ	202 UJ
subsurface	2,4,5-Trichlorophenol	(ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	2,4,6-Trichlorophenol	(ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	2,4-Dichlorophenol	(ug/kg)	1	0	0						60 U	60 U	60	60 U	60 U
subsurface	2,4-Dimethylphenol	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	2,4-Dinitrophenol	(ug/kg)	1	0	0						200 UJ	200 UJ	200	200 UJ	200 UJ
subsurface	2-Chlorophenol	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	2-Methylphenol	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	2-Nitrophenol	(ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	4,6-Dinitro-2-methylphenol	(ug/kg)	1	0	0						200 U	200 U	200	200 U	200 U
subsurface	4-Chloro-3-methylphenol	(ug/kg)	1	0	0						40 U	40 U	40	40 U	40 U
subsurface	4-Methylphenol	(ug/kg)	1	1	100	290	290	290	290	290	290	290	290	290	290
subsurface	4-Nitrophenol	(ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	Pentachlorophenol	(ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	Phenol	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
surface	Dimethyl phthalate	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	Diethyl phthalate	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	Dibutyl phthalate	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	Butylbenzyl phthalate	(ug/kg)	6	1	16.7	231 J	231 J	231	231 J	231 J	19 U	231 J	116	20 U	223 UJ
surface	Di-n-octyl phthalate	(ug/kg)	6	2	33.3	437 J	612 J	525	437 J	437 J	19 U	612 J	215	20 U	437 J
surface	Bis(2-ethylhexyl) phthalate	(ug/kg)	6	6	100	91	4420 J	1890	320	3240 J	91	4420 J	1890	320	3240 J
subsurface	Dimethyl phthalate	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Diethyl phthalate	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Dibutyl phthalate	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Butylbenzyl phthalate	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Di-n-octyl phthalate	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Bis(2-ethylhexyl) phthalate	(ug/kg)	1	1	100	270	270	270	270	270	270	270	270	270	270
surface	Bis(2-chloro-1-methylethyl) ether	(ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	2,4-Dinitrotoluene	(ug/kg)	6	0	0						96 U	223 UJ	151	100 U	202 UJ
surface	2,6-Dinitrotoluene	(ug/kg)	6	0	0						96 U	223 UJ	151	100 U	202 UJ
surface	2-Chloronaphthalene	(ug/kg)	6	0	0						18.2 UJ	22.3 UJ	20	20 U	20.2 UJ
surface	2-Nitroaniline	(ug/kg)	6	0	0						96 U	223 UJ	151	100 U	202 UJ
surface	3,3'-Dichlorobenzidine	(ug/kg)	6	0	0						96 U	223 UJ	151	100 U	202 UJ
surface	3-Nitroaniline	(ug/kg)	6	0	0						120 U	223 UJ	161	120 U	202 UJ
surface	4-Bromophenyl phenyl ether	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	4-Chloroaniline	(ug/kg)	6	0	0						58 U	223 UJ	131	60 U	202 UJ

Table 2. Queried Sediment Chemistry Data.

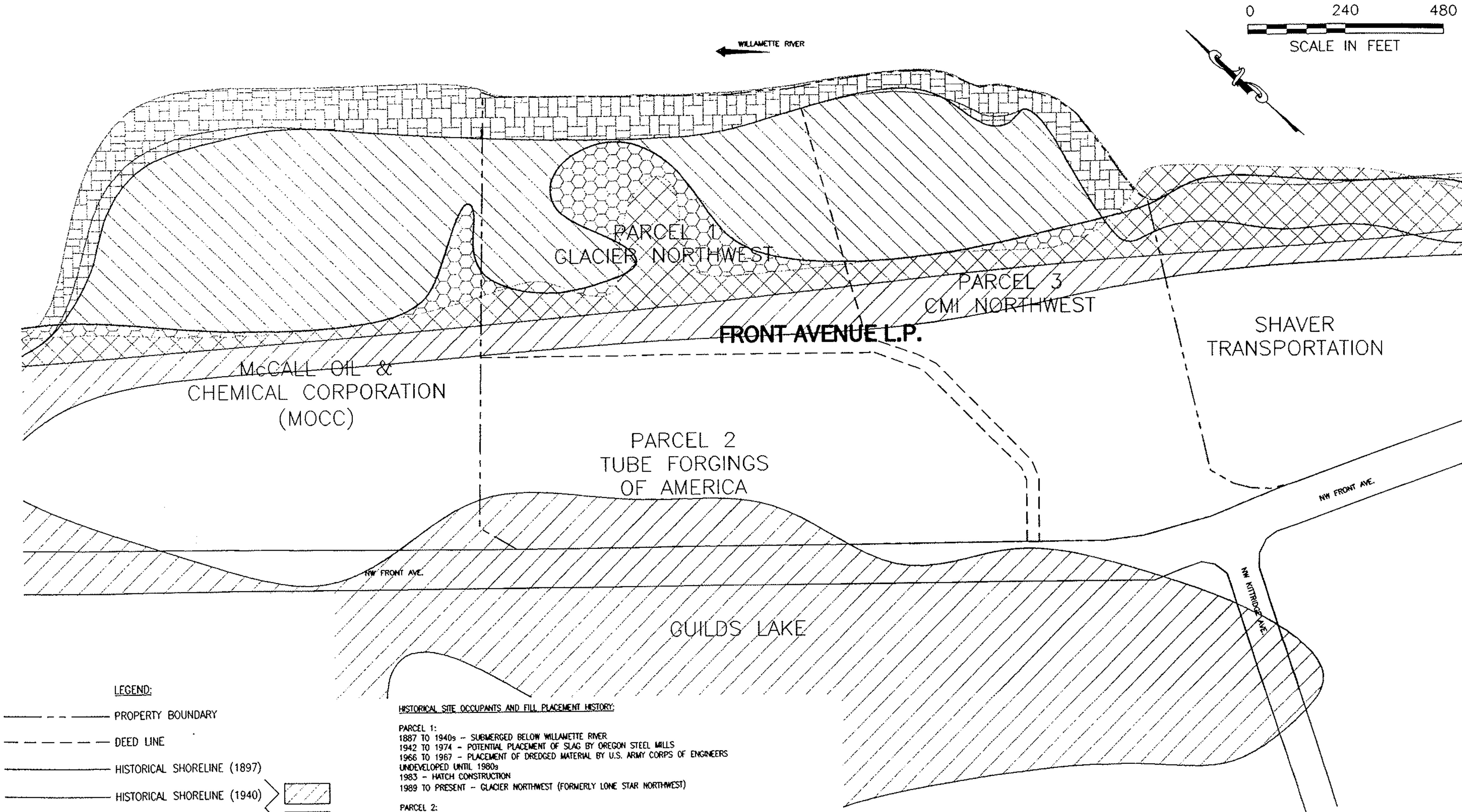
Surface or Subsurface	Analyte	Units	N	N Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	4-Chlorophenyl phenyl ether	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	4-Nitroaniline	(ug/kg)	6	0	0						96 U	223 UJ	151	100 U	202 UJ
surface	Aniline	(ug/kg)	3	0	0						182 UJ	223 UJ	202	202 UJ	202 UJ
surface	Benzoic acid	(ug/kg)	6	0	0						190 U	1110 UJ	603	200 U	1010 UJ
surface	Benzyl alcohol	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	Bis(2-chloroethoxy) methane	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	Bis(2-chloroethyl) ether	(ug/kg)	6	0	0						38 U	223 UJ	121	40 U	202 UJ
surface	Carbazole	(ug/kg)	6	1	16.7	350 J	350 J	350	350 J	350 J	19 U	350 J	132	20 U	202 UJ
surface	Dibenzofuran	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	Hexachlorobenzene	(ug/kg)	9	1	11.1	1.38 J	1.38 J	1.38	1.38 J	1.38 J	1.38 J	223 UJ	74.7	20 U	202 UJ
surface	Hexachlorobutadiene	(ug/kg)	9	0	0						1.33 UJ	223 UJ	74.7	20 U	202 UJ
surface	Hexachlorocyclopentadiene	(ug/kg)	6	0	0						96 U	223 UJ	151	100 U	202 UJ
surface	Hexachloroethane	(ug/kg)	9	0	0						1.33 UJ	223 UJ	74.7	20 U	202 UJ
surface	Isophorone	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	Nitrobenzene	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	N-Nitrosodimethylamine	(ug/kg)	3	0	0						910 UJ	1110 UJ	1010	1010 UJ	1010 UJ
surface	N-Nitrosodipropylamine	(ug/kg)	6	0	0						38 U	223 UJ	121	40 U	202 UJ
surface	N-Nitrosodiphenylamine	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	Bis(2-chloroisopropyl) ether	(ug/kg)	3	0	0						182 UJ	223 UJ	202	202 UJ	202 UJ
subsurface	Bis(2-chloro-1-methylethyl) ether	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	2,4-Dinitrotoluene	(ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	2,6-Dinitrotoluene	(ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	2-Chloronaphthalene	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	2-Nitroaniline	(ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	3,3'-Dichlorobenzidine	(ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	3-Nitroaniline	(ug/kg)	1	0	0						120 U	120 U	120	120 U	120 U
subsurface	4-Bromophenyl phenyl ether	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	4-Chloroaniline	(ug/kg)	1	0	0						60 U	60 U	60	60 U	60 U
subsurface	4-Chlorophenyl phenyl ether	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	4-Nitroaniline	(ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	Benzoic acid	(ug/kg)	1	1	100	380	380	380	380	380	380	380	380	380	380
subsurface	Benzyl alcohol	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Bis(2-chloroethoxy) methane	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Bis(2-chloroethyl) ether	(ug/kg)	1	0	0						40 U	40 U	40	40 U	40 U
subsurface	Carbazole	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Dibenzofuran	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Hexachlorobenzene	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Hexachlorobutadiene	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Hexachlorocyclopentadiene	(ug/kg)	1	0	0						100 UJ	100 UJ	100	100 UJ	100 UJ
subsurface	Hexachloroethane	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Isophorone	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Nitrobenzene	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U

Table 2. Queried Sediment Chemistry Data.

Surface or				N	%	Detected Concentrations					Detected and Nondetected Concentrations				
Subsurface	Analyte	Units	N	Detected	Detected	Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	N-Nitrosodipropylamine	(ug/kg)	1	0	0						40 U	40 U	40	40 U	40 U
subsurface	N-Nitrosodiphenylamine	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
surface	1,2-Dichlorobenzene	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	1,3-Dichlorobenzene	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	1,4-Dichlorobenzene	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
surface	1,2,4-Trichlorobenzene	(ug/kg)	6	0	0						19 U	223 UJ	111	20 U	202 UJ
subsurface	1,2-Dichlorobenzene	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	1,3-Dichlorobenzene	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	1,4-Dichlorobenzene	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	1,2,4-Trichlorobenzene	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U

SUPPLEMENTAL FIGURES

Figure 4. Chronology of Fill Placement (1897 to Present) (MFA 2002)
Figure 5. Parcel 1 – Glacier Northwest Site Layout (MFA 2002)
Figure 6. Parcel 2 – Tube Forgings of America Site Layout (MFA 2002)
Figure 7. Parcel 3 – CMI Northwest Site Layout (MFA 2002)



LEGEND:

- PROPERTY BOUNDARY
- DEED LINE
- HISTORICAL SHORELINE (1897)
- HISTORICAL SHORELINE (1940)
- HISTORICAL SHORELINE (1954)
- HISTORICAL SHORELINE (1961)
- HISTORICAL SHORELINE (1970)
- HISTORICAL SHORELINE (1977)
- HISTORICAL SHORELINE (1990)

HISTORICAL SITE OCCUPANTS AND FILL PLACEMENT HISTORY:

PARCEL 1:
1887 TO 1940s – SUBMERGED BELOW WILLAMETTE RIVER
1942 TO 1974 – POTENTIAL PLACEMENT OF SLAG BY OREGON STEEL MILLS
1966 TO 1967 – PLACEMENT OF DREDGED MATERIAL BY U.S. ARMY CORPS OF ENGINEERS
UNDEVELOPED UNTIL 1980s
1983 – HATCH CONSTRUCTION
1989 TO PRESENT – GLACIER NORTHWEST (FORMERLY LONE STAR NORTHWEST)

PARCEL 2:
UNDEVELOPED UNTIL 1942
1942 TO 1976 – OREGON STEEL MILLS AND POTENTIAL PLACEMENT OF SLAG
1979 TO PRESENT – TUBE FORGINGS OF AMERICA

PARCEL 3:
1897 TO 1940s – NORTH PART OF PARCEL SUBMERGED BELOW WILLAMETTE RIVER. SOUTH PART UNDEVELOPED.
1942 TO 1974 – POTENTIAL PLACEMENT OF SLAG BY OREGON STEEL MILLS
1966 TO 1967 – PLACEMENT OF DREDGED MATERIAL BY ACOE.
UNDEVELOPED UNTIL 1988
1988 TO 1993 – TRICON FOREST PRODUCTS
1994 TO PRESENT – CMI NORTHWEST (FORMERLY HAMPTON LUMBER SALES)

Suite B
7223 NE Hazel Dell Ave.
Vancouver, WA 98665

P 360.694.2691
F 360.906.1958

MAUL FOSTER ALONGI

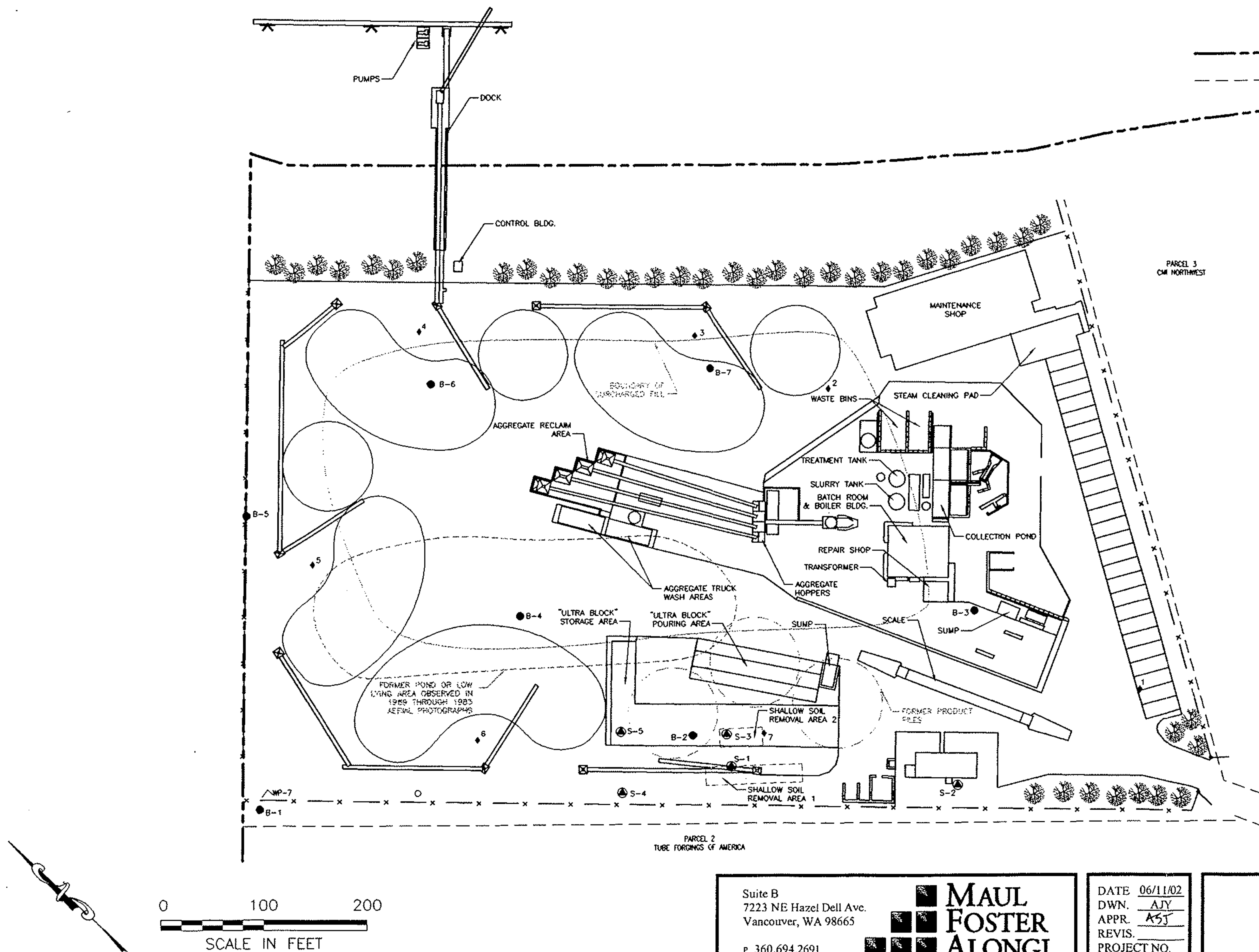
DATE 06/11/02
DWN. AJY
APPR. AJT
REVIS.
PROJECT NO.
0025.01.01

Figure 4
FRONT AVENUE L.P.
PORTLAND, OREGON

CHRONOLOGY OF FILL PLACEMENT (1897 TO PRESENT)

File: G:\0000\0025.01_FRONT AVENUE\01\SITE MAPS.DWG Last edited: JUN. 19, 2002 @ 3:31 p.m. by: JHESS Xrefs: base black/white

LAYOUT 1



LEGEND:

- PROPERTY BOUNDARY
- PARCEL LINE
- DRY WELLS
- SURFACE SAMPLES (SE/E, 1989b)
- TEST BORINGS (SE/E, 1989b)

NOTES:

1) BASE MAP PROVIDED BY GLACIER NORTHWEST, INC. (MARCH 4, 2002)

2) SHALLOW SOIL REMOVALS DOCUMENTED IN SE/E, 1990.

Suite B
7223 NE Hazel Dell Ave.
Vancouver, WA 98665

P 360.694.2691
F 360.906.1958

MAUL FOSTER ALONGI

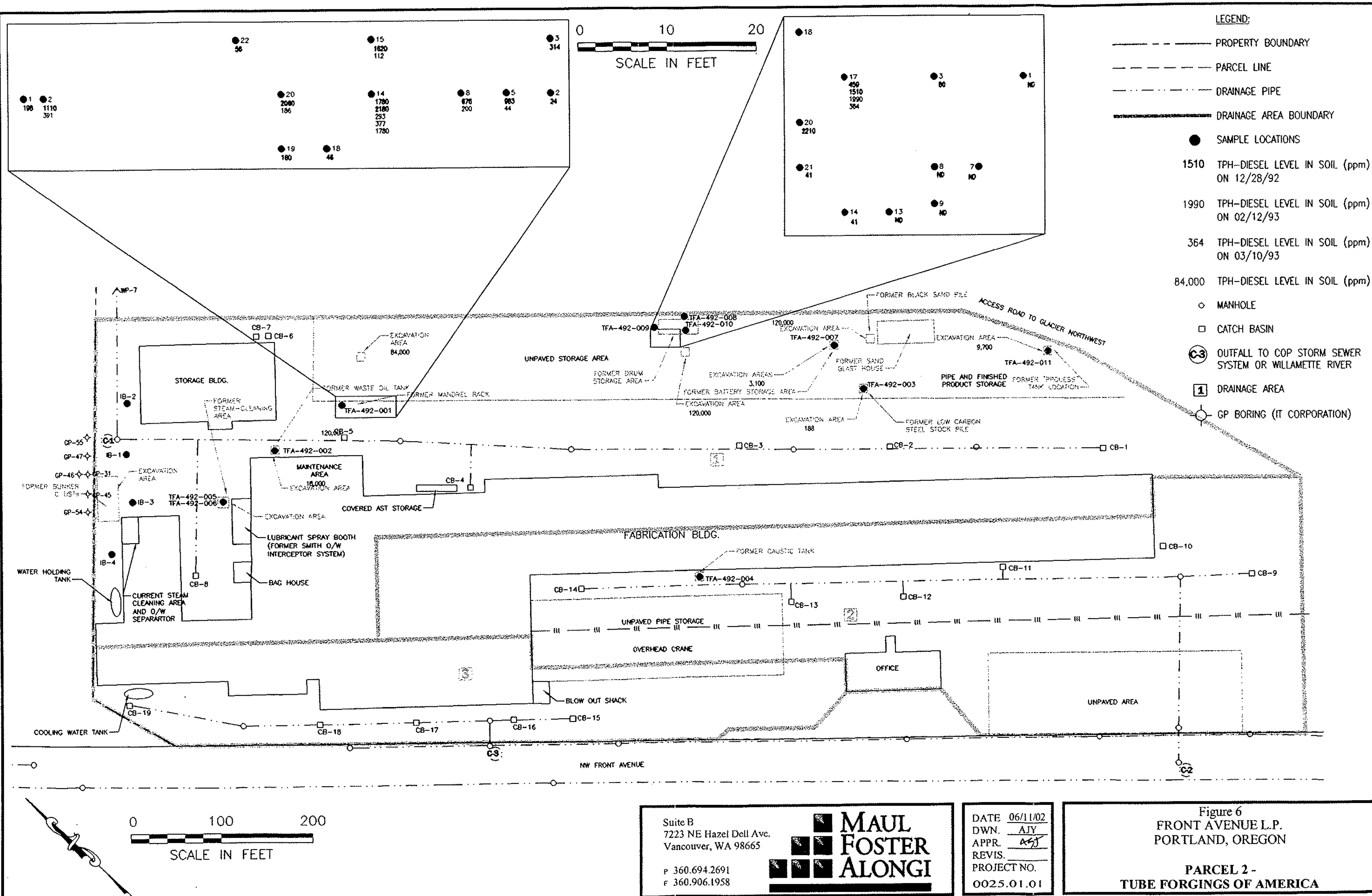
DATE 06/11/02
DWN. AJY
APPR. ASJ
REVIS.
PROJECT NO.
0025.01.01

Figure 5
FRONT AVENUE L.P.
PORTLAND, OREGON

PARCEL 1 -
GLACIER NORTHWEST SITE LAYOUT

File: G:\0000\0025.01_FRONT AVENUE\01\SITE MAPS.DWG Last edited: JUN. 19, 2002 @ 3:33 p.m. by: JNESS Xrefs: base black/white

LAYOUT: 2



Suite B
7223 NE Hazel Dell Ave.
Vancouver, WA 98665
P 360.694.2691
F 360.906.1958

MAUL FOSTER ALONGI

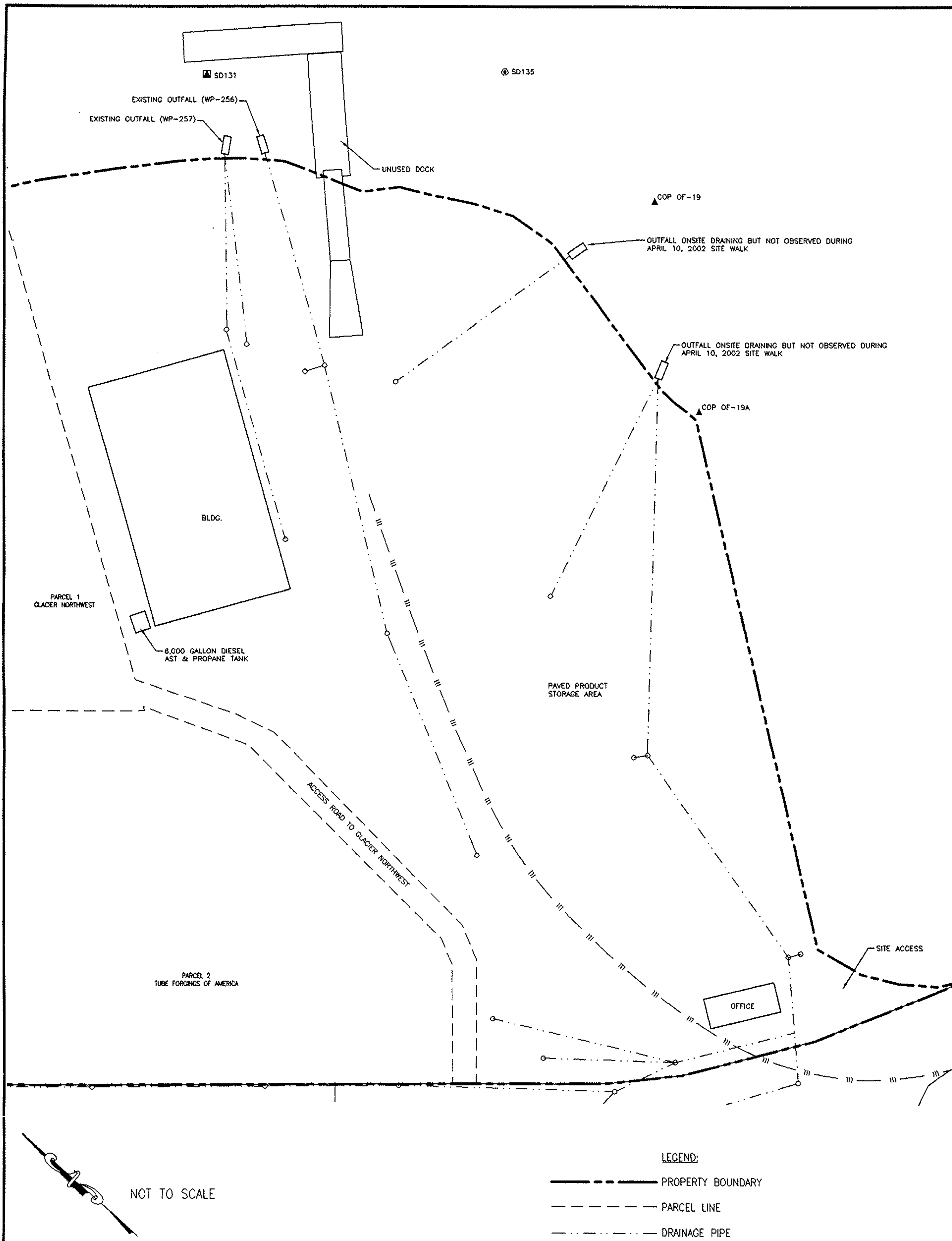
DATE	06/11/02
DWN.	AJY
APPR.	
REVIS.	
PROJECT NO.	0025.01.01

Figure 6
FRONT AVENUE L.P.
PORTLAND, OREGON

PARCEL 2 - TUBE FORGINGS OF AMERICA

File: G:\0000\0025.01 FRONT AVENUE\01\SITE MAPS.DWG Last edited: JUN. 19, 2002 @ 3:38 p.m. by: JHESS Xrefs: base black/white

LAYOUT 3



NOT TO SCALE

LEGEND:

- PROPERTY BOUNDARY
- PARCEL LINE
- DRAINAGE PIPE
- RAILROAD TRACKS
- CATCH BASIN

NOTE:

BASE MAP SCANNED FROM R & W ENGINEERING AND ETS PACIFIC SITE PLANS, DATED APRIL 1988. STORMWATER FEATURES, RAILROAD TRACKS, AND BUILDING LOCATIONS ARE ESTIMATED.

Suite B
7223 NE Hazel Dell Ave.
Vancouver, WA 98665

P 360.694.2691
F 360.906.1958

MAUL FOSTER ALONGI

DATE 06/11/02
DWN. AJY
APPR. ASJ
REVIS.
PROJECT NO.
0025.01.01

Figure 7
FRONT AVENUE L.P.
PORTLAND, OREGON

PARCEL 3 - CMI NORTHWEST SITE LAYOUT

File: G:\0000\0025.01_FRONT AVENUE\01\SITE MAPS.DWG Last edited: JUN. 19, 2002 @ 3:54 p.m. by: JNESS Xrefs: base black/white

LAYOUT: 4